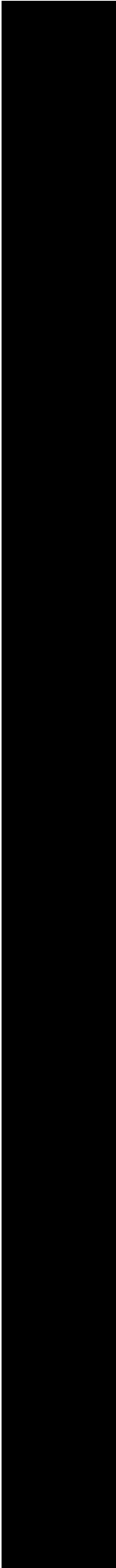


# 9360/30/15/12 Automated Cartridge System

Hardware Operator's Guide







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Hardware Operator's Guide

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# Summary of Changes

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EC Number	Date	Type	Change
45770	August 1993	Original Issue	
111379	January 2000	Ninth Edition	Refer to this edition for a description of changes.
111632	March 2001	Tenth Edition	Added T9940 tape drive and cartridge information.

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# Preface

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This guide describes how to operate the 9360 library storage module (LSM). It is intended primarily for data center operators who operate the LSM. System programmers and computer system administrators might also find the information in this guide useful.

## ■ Organization

This guide has four chapters and one appendix:

- Chapter 1** “General Information” describes the hardware components in the Nearline Automated Cartridge Subsystem (ACS).
- Chapter 2** “Controls and Indicators” shows the locations of the operator panels and indicators for the LSM and cartridge drives, and describes the functions. The chapter also shows the locations of the emergency power-off switches for the LSM and cartridge subsystem, and the power switch for the 9330 LMU.
- Chapter 3** “Operating the 9360 LSM” contains the procedures to operate the LSM. The chapter explains how to power on and power off the LSM and LMU, and how to operate the LSM in automated and manual modes.
- Chapter 4** “Obtaining Support” describes how to contact Customer Support Services for assistance if the LSM has a hardware or software problem.
- Appendix A** “Cartridge Tape Information” describes how to prepare, inspect, store, clean, and repair cartridges. The appendix also lists the criteria that colored cartridges must meet to be used in the LSM.
- Glossary** The Glossary defines new or special terms and abbreviations used in this guide.
- Index** The Index assists in locating information in this guide.

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**A caution informs the reader of conditions that might result in damage to hardware, corruption of data, corruption of application software, or long-term health problems in people. A caution always precedes the information to which it relates.**

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## ■ Related Publications

The following list contains the names and order numbers of publications that provide additional information about the LSM, the cartridge subsystems, and cartridge tapes.

<b>4410/9310</b>	<b>Part Number</b>
<i>Automated Cartridge Subsystem Hardware Operator's Guide</i>	9206
<b>StorageTek Cartridge Subsystems</b>	<b>Part Number</b>
<i>4480/4780 Cartridge Subsystem Operator's Guide</i>	95688
<i>4490 Cartridge Subsystem Operator's Guide</i>	9600
<i>9490 Cartridge Subsystem Operator's Guide</i>	9634
<i>9840 Tape Drive User's Reference Manual</i>	95739



<b>StorageTek Cartridge Subsystems</b>	<b>Part Number</b>
<i>SD-3 Cartridge Subsystem Operator's Guide</i>	9787
<i>T9940 Tape Drive Operator's Guide</i>	95989

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**Software Publications**

<i>Operator's Guide (HSC MVS/XA-ESA Implementation)</i>	4044265XX
<i>System Programmer's Guide (HSC MVS/XA-ESA Implementation)</i>	4044266XX
<i>Operator's Reference Summary (HSC MVS/XA-ESA Implementation)</i>	4044306XX
<i>HSC Messages and Codes</i>	4044267XX
<i>Operator's Guide (HSC VM Implementation)</i>	4044292XX
<i>Operator's Reference Summary (HSC VM Implementation)</i>	4044509XX
<i>System Programmer's Guide (HSC VM Implementation)</i>	4044293XX
<i>SCP Messages and Codes</i>	4044294XX
<i>4400 Automated Cartridge System UNIX-Based Library Server System Administrator's Guide</i>	404340601
<i>4400 Automated Cartridge System UNIX-Based Library Server System Programmer's Guide</i>	404340701
* Some ACSLS, Solaris, and AIX documentation may also be obtained at the following Internet website: <a href="http://www.support.storagetek.com">http://www.support.storagetek.com</a> , under the software link.	

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<b>IBM Publications</b>	<b>Part Number</b>
<i>Care and Handling of the IBM Magnetic Tape Cartridge</i>	GA32-0047
<i>Tape and Cartridge Requirements for the IBM 3480 Tape Drive</i>	GA32-0048

<b>ANSI Publications</b>	<b>Part Number</b>
<i>American National Standard Magnetic Tape and Cartridge for Information Interchange</i>	ACS X3B5

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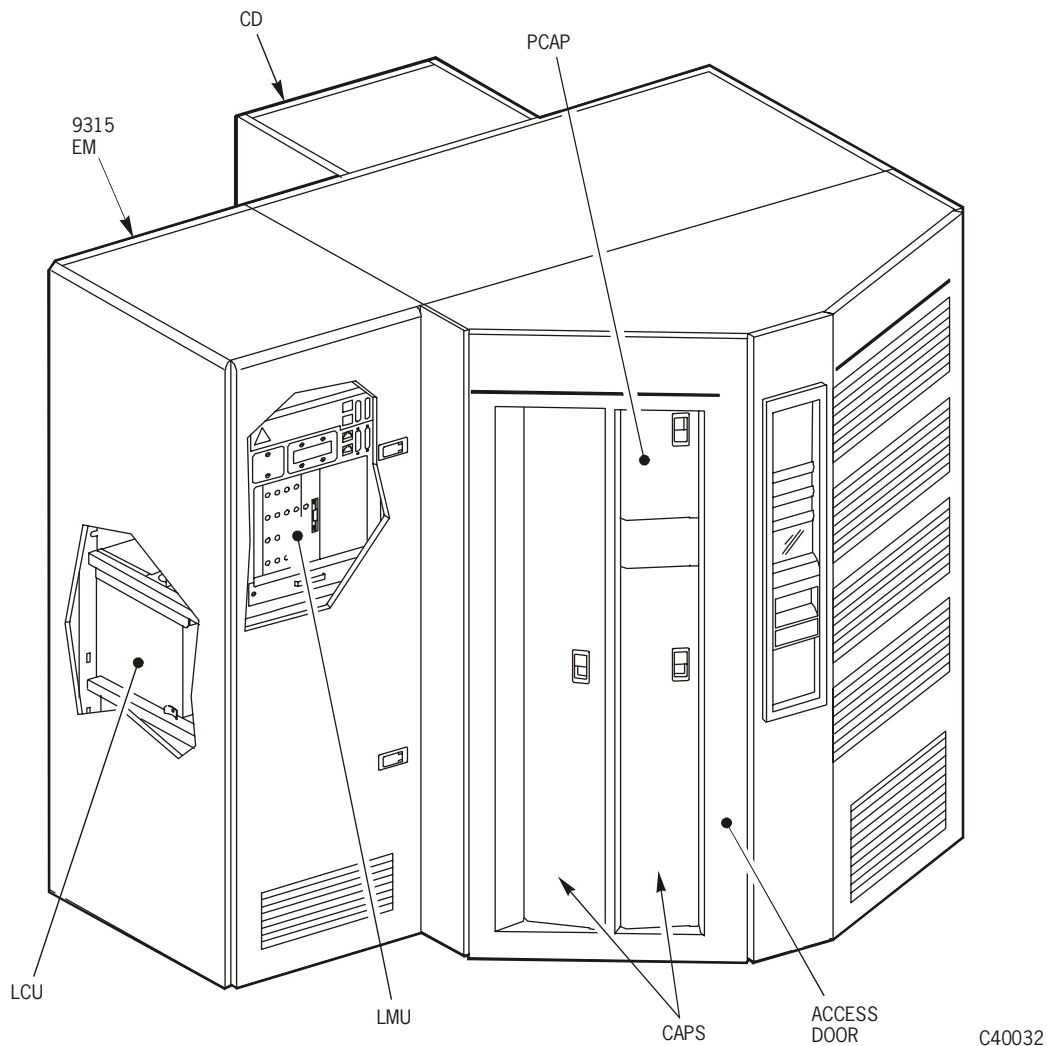
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# General Information

## 1

This chapter describes the hardware components of the Nearline Automated Cartridge System (ACS) with the 9360 Library Storage Module (LSM). [Figure 1-1](#) shows the 9360 LSM with an attached cartridge drive (CD) and the 9315 Electronics Module (EM). The following pages describe the hardware and software components that make up the Nearline ACS and briefly explain how each component functions.

**Figure 1-1. 9360 LSM with Attached 9315 EM and Cartridge Drive**



## ■ Automated Cartridge System

The Nearline ACS is a fully automated, cartridge-based, tape-library system. The operating system host software component or library server software sends a cartridge move request to an LMU. The Library Management Unit (LMU) sends the request to the Library Control Unit (LCU), which controls the electronics for the LSM robot. The robot retrieves stored cartridges and mounts them onto CDs or tape drives for read/write operations. When the read/write operations are complete, the robot dismounts the cartridges and places them back into storage cells in the LSM.

## ■ Nearline Software

The Nearline software is the interface between one or more client operating systems and the hardware components of the ACS. The software acts as the overall manager of the system and directs the automated mounting, dismounting, and moving of cartridges in the LSM.

The software can reside in the client operating system or run on a server platform with a portion of the package running in the client system. The configuration depends on the type of operating environment in which the ACS is running.

Refer to your software publications for more information about the Nearline software.

## ■ Electronics Module and Library Management Unit

A 9312 or 9315 EM is attached to each 9360 LSM. The 9330 Library Management Unit (LMU) is a stand-alone version and is not attached to the LSM.

**9315 EM** Contains the LMU and the library control unit (LCU). Only one 9360 LSM in an ACS has a 9315 EM attached. This is because one LMU can manage up to 16 LSMs in a maximum ACS configuration.

**9312 EM** Contains one LCU. In an ACS configuration with more than one 9360 LSM, the 9312 EM is attached to the 9360 LSMs that do not have the 9315 EM attached.

In an ACS configuration that contains a 9330 stand-alone LMU, the 9312 EM is attached to every 9360 LSM.

**9330 LMU** Manages LSMs in an ACS configuration that includes a 9360 connected to 4410, 9310, or Extended Store LSMs.

The LMU manages the LSMs in an ACS. The LMU receives cartridge mount and dismount requests from the client operating system by way of the Nearline software.



The LMU sends instructions to the LCU attached to the LSM designated in the move request. The LCU decodes the instructions into specific move commands, and sends the commands to the LSM robot, where they are executed.

## ■ 9360 Library Storage Module

The LSM houses the cartridges and the robot. The 9360 LSM can be configured for three different storage capacities—approximately 500, 750, or 1000 cartridges. Storage capacity depends on the number of walls used to attach cartridge drives or tape drives, pass-thru ports (PTPs), and cartridge access ports (CAPs) installed.

Up to sixteen 9360 LSMs can be connected in a single ACS. If the cartridge drives or tape drives are busy in one LSM, cartridges are automatically sent, by way of a PTP, to the next LSM that has an available drive.

The access door on the 9360 LSM contains one or two CAPs and one priority cartridge access port (PCAP).

### Cartridge Access Port

The CAP is the storage area where you add cartridges to or remove cartridges from an LSM without interrupting normal mounts and dismounts by the robot. The CAP is on the LSM access door.

The standard CAP consists of two magazines, each containing 10 cartridge storage cells. An optional CAP consists of three magazines, providing a total capacity of 50 cartridges.

You can leave the magazines in the CAP and place single cartridges into the magazine cells. You can also remove the magazines, load them with cartridges, and place the magazines into the CAP.

In data processing environments where numerous enter and eject operations are performed, you can maintain two sets of magazines. One set is in the CAP, receiving cartridges in an eject operation; another set is outside the CAP, preloaded with cartridges, ready to be placed in the CAP for an enter operation.

### Priority Cartridge Access Port

The PCAP is the storage area where you add one cartridge to or remove one cartridge from an LSM. A cartridge entered or ejected into the PCAP takes priority over the movement of cartridges in the CAP. When the PCAP operation is complete, the robot resumes its enter or eject operation through the CAP until finished.

## Pass-thru Port

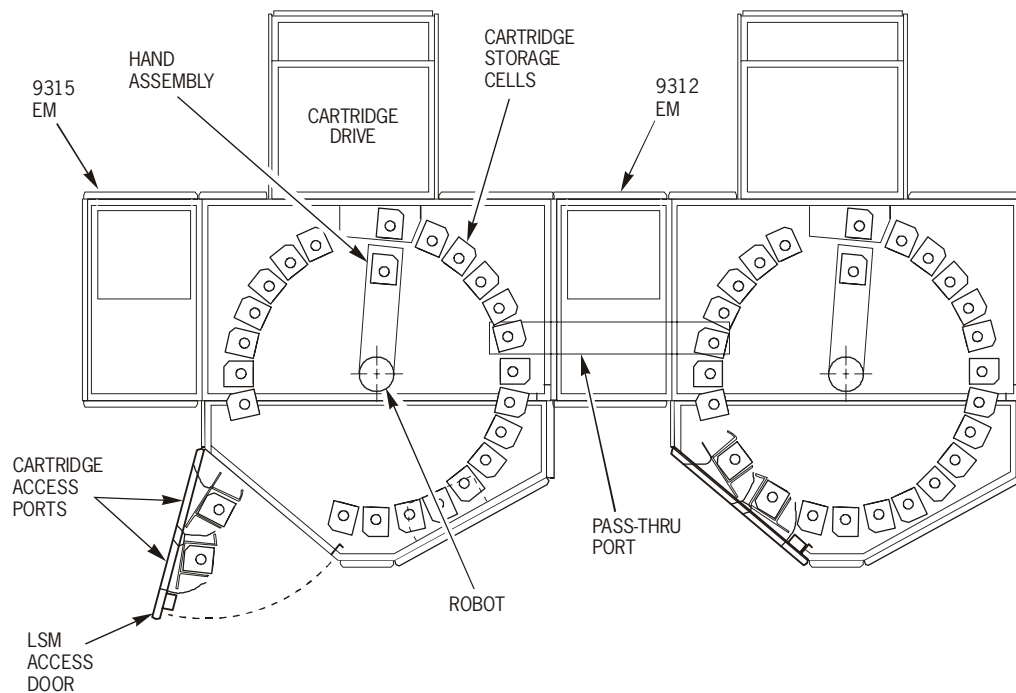
When an ACS contains more than one LSM, the PTP connects a 9360 LSM to another 9360 LSM, or to a 4410, 9310, or Extended Store LSM. When a request is made to move a cartridge in one LSM to a drive or storage cell in another LSM, the robot in the source LSM delivers the cartridge to the PTP. The PTP transfers the cartridge to the receiving LSM. The robot in the receiving LSM removes the cartridge from the PTP and delivers it to an available drive, storage cell, or to another PTP.

The PTP can transfer one or two cartridges at a time.

The PTP is also used when the scratch tapes have been depleted in an LSM. The PTP passes scratch tapes from an LSM with available tapes to an LSM that has depleted its source of scratch tapes.

**Figure 1-2** is a top view of two 9360 LSMs connected by a PTP. The figure shows the location of the access door, CAPs, cartridge drives, and the 9315 and 9312 EMs, plus the arrangement of storage cells inside the LSM.

**Figure 1-2. 9360 Library Storage Module, Top View**



C40033

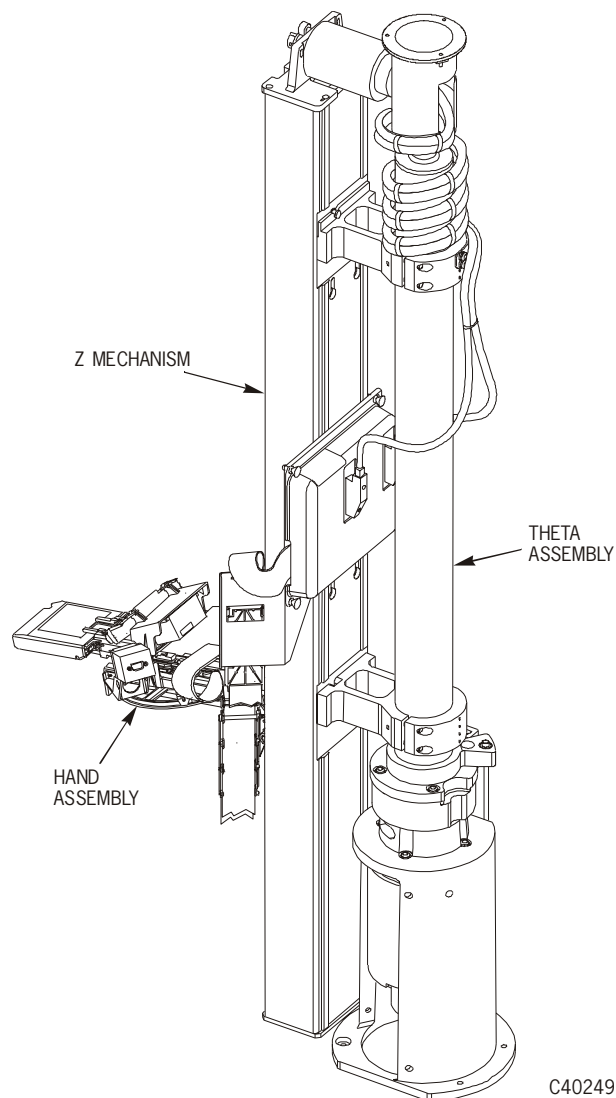
## Robot

The robot moves cartridges between the storage cells and the drives. The robot consists of a theta assembly, Z mechanism, and hand assembly. [Figure 1-3](#) shows these components.

### *Theta Assembly*

The theta assembly consists of a vertical shaft that moves the hand assembly in a circle. The theta assembly is supported at the center of rotation on a stationary vertical pedestal, which is secured to the floor of the LSM.

**Figure 1-3. 9360 LSM Robotic Components**



### ***Z Mechanism***

The Z mechanism is attached to the theta assembly. The Z mechanism moves the hand assembly vertically along the cells and cartridge drives/tape drives in the LSM.

### ***Hand Assembly***

The hand assembly grasps a cartridge and delivers it to the designated location, such as a CAP or drive. The hand grasps the cartridge even if the LSM is powered-off in an emergency, or if the system loses power. See [“Removing a Cartridge from the Hand Assembly” in Chapter 3, “Operating the 9360 LSM,”](#) if this occurs.

When the LSM is offline and not performing automated tape operations, you can enter through the access door to perform manual tape operations. You might need to move the robot to gain access to an attached tape drive, or to remove a cartridge from its storage cell to perform a manual mount. See [“Moving the Robot” in Chapter 3, “Operating the 9360 LSM.”](#)

## **LSM Safety Features**

Safety features are incorporated into the 9360 LSM.

### ***LSM Safety Interlocks***

If the access door to the LSM is opened, electrical interlocks remove power from the robot to prevent injury to anyone entering the LSM.

### ***Prevention of LSM Access Door Closing***

By following the safety procedures described in [“Entering the LSM” in Chapter 3, “Operating the 9360 LSM,”](#) someone inside the LSM can prevent anyone outside from closing the LSM access door.

### ***LSM Emergency Power-off Switch***

The LSM has two emergency power-off (EPO) switches, one on the inside of the access door and one on the operator panel. Pressing either switch immediately removes power from the EM and the LSM. See [“Emergency Power-Off Switches” in Chapter 2, “Controls and Indicators,”](#) for more information about these switches. [Figure 2-1 on page 2-2](#) shows the EPO switch on the LSM operator panel. [Figure 2-4 on page 2-15](#) shows the EPO switch inside the LSM.

### ***LSM Smoke Detector***

A smoke detector on the LSM top frame detects any smoke in the LSM. If smoke is detected, an emergency power-off is performed on the LSM, removing power from the robot and the LCU.

### ***Internal Fire Suppression System Ports***

The LSM contains two ports to which the user may connect a fire suppression system. This system, as well as its controls and sensors, is supplied by a third-party vendor. A StorageTek marketing representative can provide more information.

### ***Robot Obstruction Search***

During initialization, the robot moves slowly and sweeps through its full range of motion. In this mode, current to the theta motor is limited, and you can stop the robot with your hand. If any physical obstruction prevents the robot from moving, the robot stops and an error is posted. If the robot movement is disturbed but not completely stopped, the robot continues to sweep, but an error is posted at the end of initialization and the robot does not go into normal move mode.

## ■ **Tape Drives**

Tape drives can be attached to Panels 1 and 3 of the LSM.

**Note:** The 9360 supports a maximum of two drive types. For example, the LSM may contain: (1) 9840 and TimberLine drives, (2) 9840 and SD-3 drives, or (3) TimberLine and SD-3 drives.

The LSM cannot support 9840, SD-3, and Timberline drives.

The 9360 LSM works with the following tape drives:

- 4480 (18-track) Cartridge Subsystem
- 4490 (36-track) Cartridge Subsystem
- 9490 (36-track) Cartridge Subsystem [TimberLine]
- 9840 (288-track) Tape Drive
- SD-3 (helical scan) Cartridge Subsystem [RedWood]
- T9940 (288-track) Tape Drive

#### **Notes:**

1. The 9840 and T9940 drives require a 9741 Drive Cabinet.
2. 4480 or 4490 cartridge drives contain two or four tape transports.
3. 9490 cartridge drives contain two or four controller/transport units (CTUs).
4. SD-3 cartridge drives contain from one to four CTUs.

## **Cartridge Subsystem**

There are two designs for cartridge subsystems. One design covers the 4480 and 4490 product lines while a second design covers the 9490 and SD-3 product lines.

The 4480 or 4490 cartridge subsystem consists of one or two CDs within a cabinet and one control unit (CU), each one in a separate cabinet. A CD can have two or four transports, and it is cabled to the CU. The control unit is the controller/interface between the CDs and the input/output (I/O) channels.

The 9490 or SD-3 cartridge subsystem consists of a cabinet containing controller/transport units (CTUs). Each CTU has its own control unit that interfaces with a single tape transport to perform read/write operations.

Refer to your cartridge subsystem publications for additional information.

## **9741 Drive Cabinet**

The 9741 Drive Cabinet holds one to ten 9840 or T9940 Tape Drives. A 9741 can be attached to Panels 1 and 3 of the LSM.

Refer to your 9840 or T9940 Tape Drive publications for additional information.

This chapter shows the locations and describes the functions of the:

- Library Storage Module (LSM) operator panel
- Cartridge drive operator panel inside the LSM
- Emergency power-off (EPO) switches
- Power switch for the Library Management Unit (LMU)

Use the LSM operator panel to monitor and execute the various operations associated with the LSM.

Use the transport/tape drive operator panel on the inside of the LSM to perform manual cartridge mounts and dismounts when the LSM is offline.

Use the LSM and cartridge subsystem **EPO** switches, and the LMU power-off switch, to immediately remove power from the units.

## ■ LSM Operator Panel

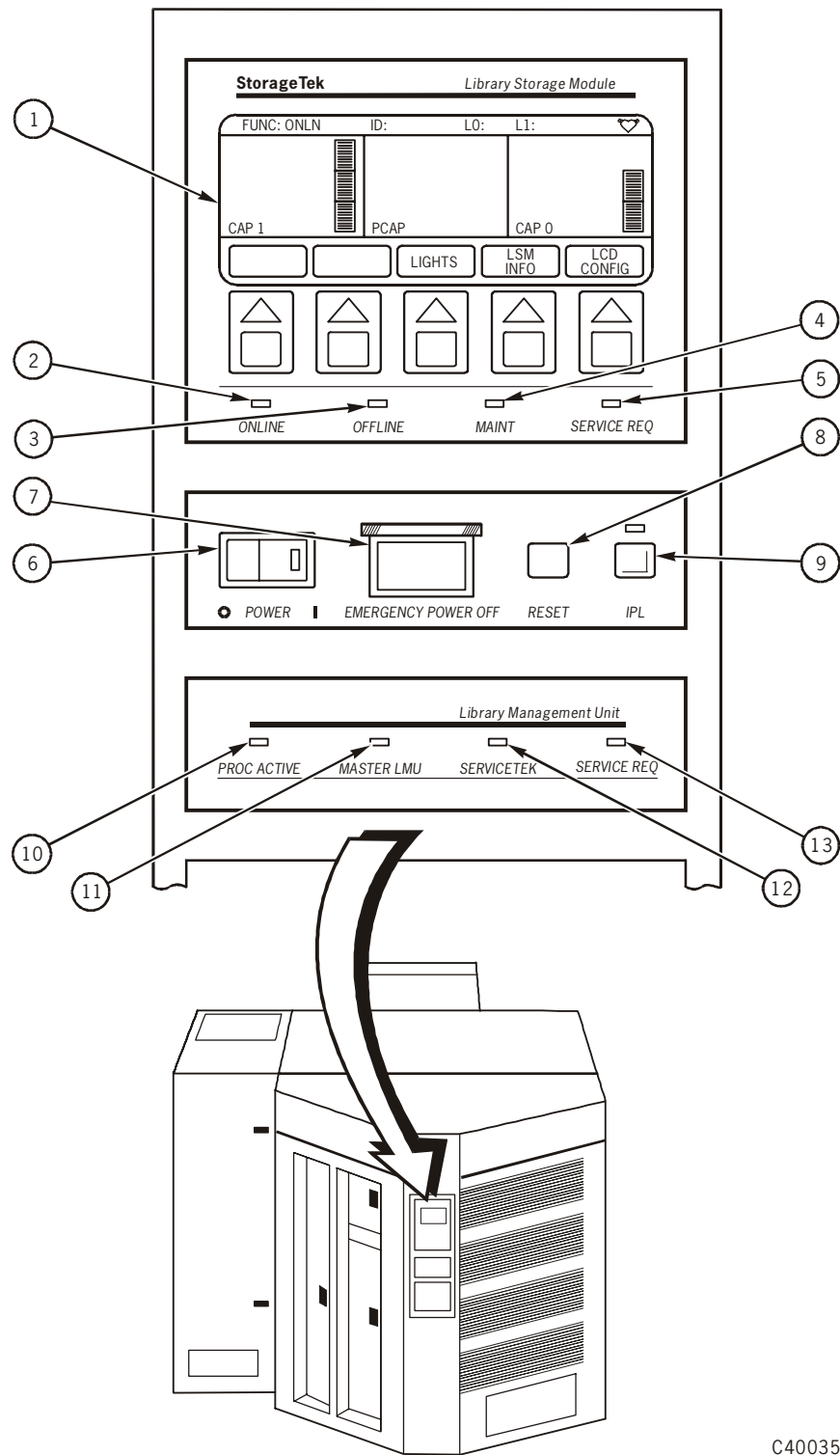
The LSM operator panel is beside the door of the LSM directly above the small viewing window. The panel:

- Shows status and diagnostic information
- Shows number and location of cartridges in the Cartridge Access Ports (CAPs) and the Priority Cartridge Access Port (PCAP)
- Contains LSM switches: **POWER**, **EPO**, **IPL**, and **RESET**
- Displays LMU status information when the LMU is in the EM

The lower area of the panel displays LMU information. For LSMs with the 9312 Electronics Module (EM) attached, this area remains blank.

[Figure 2-1 on page 2-2](#) shows the panel, and [Table 2-1 on page 2-3](#) lists and describes each numbered item.

**Figure 2-1. LSM Operator Panel**



C40035



**Table 2-1. LSM Operator Panel**

<b>Item<sup>1</sup></b>	<b>Label</b>	<b>Type</b>	<b>Function</b>
1		LCD Screen	<p>Displays diagnostic and initialization messages.</p> <p>Displays OFFLINE when initialization is complete.</p> <p>Displays status information about the LSM, CAPs, and PCAP when the LSM is online. See <a href="#">Figure 2-2 on page 2-5</a> and <a href="#">Table 2-2 on page 2-6</a> for a complete description of this display screen.</p>
2	<i>ONLINE</i>	Indicator	Lights when the LSM is online.
3	<i>OFFLINE</i>	Indicator	Lights when the LSM is offline.
4	<i>MAINT</i>	Indicator	Lights in maintenance mode. Maintenance mode is an LSM state in which diagnostic routines can run. This mode is reserved for service representatives and is not used for operator tasks.
5	<i>SERVICE REQ</i>	Indicator	Lights when the LSM requires service. The LCD indicates the problem error code. Contact Customer Support Services.
6	<i>POWER</i>	Switch	Turns power on and off for the LSM and LCU. When power is turned on, wake-up procedures are started. When power is turned off, an orderly shutdown of the LSM and the LCU is performed, and power is removed.
7	<i>EMERGENCY POWER OFF</i>	Momentary Switch	<p>Immediately removes all power from the LCU and LSM and ends all activity in progress within the LSM.</p> <p><b>CAUTION:</b> Use this switch only in an emergency.</p> <p><b>Note:</b> If power is removed from the LSM using the <i>EPO</i> switch, contact Customer Support Services. Only a service representative can restore power to the unit.</p>

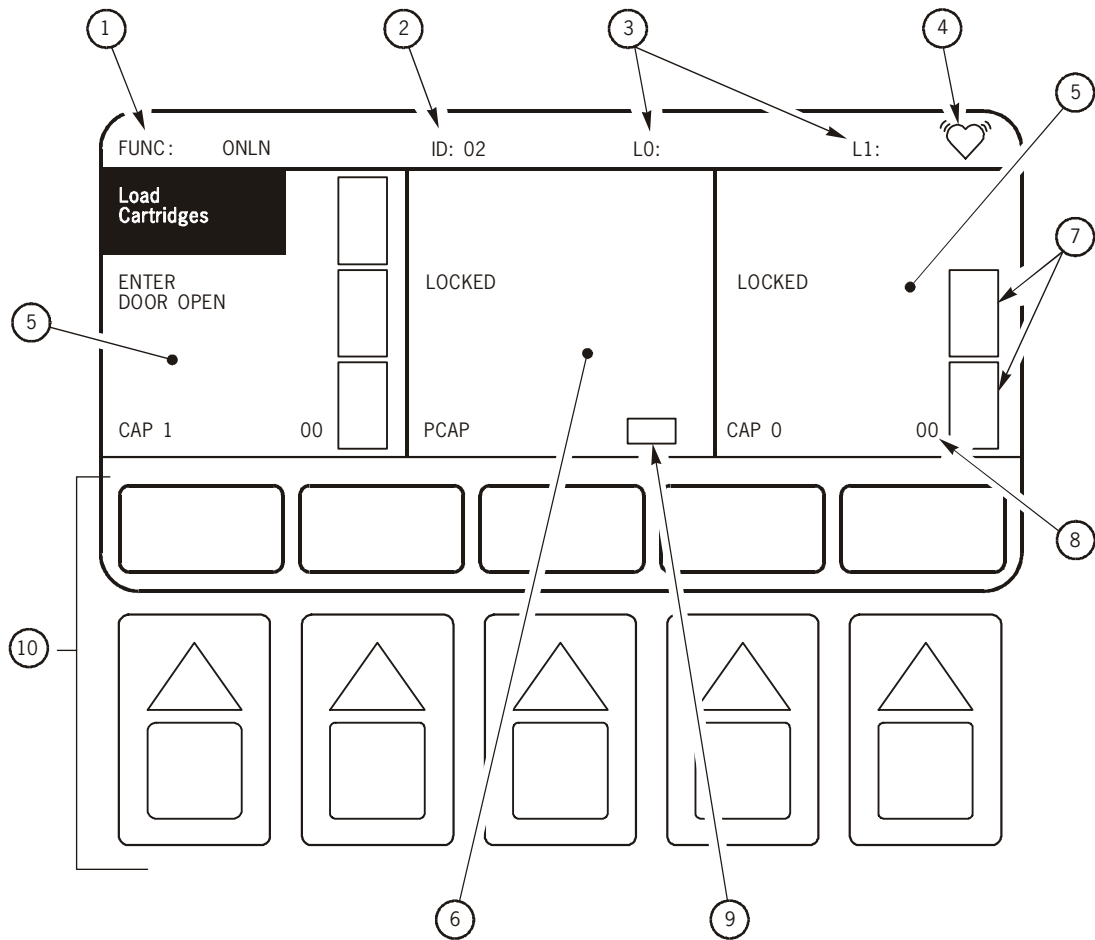
**Table 2-1. LSM Operator Panel (Continued)**

Item <sup>1</sup>	Label	Type	Function
8	<b>RESET</b>	Switch	<p>Sends an interrupt message to the LCU software.</p> <p>This switch initiates an error dump of the memory contents in the LCU.</p> <p><b>Note:</b> When the memory dump is complete, you must IPL the LSM.</p>
9	<b>IPL</b>	Switch/ Indicator	<p><b>Switch:</b> Resets LSM hardware and initiates an IPL process.</p> <p><b>Indicator:</b> Lights when an IPL process is being performed.</p>
10	<b>PROC ACTIVE<sup>2</sup></b>	Indicator	Lights if processor is functioning.
11	<b>MASTER LMU<sup>2</sup></b>	Indicator	Lights when this LMU is the master LMU in a dual LMU configuration. Blinks briefly when this is the standby LMU in a dual LMU configuration and polls the master LMU.
12	<b>SERVICETEK<sup>2</sup></b>	Indicator	Lights when a problem has been detected in the ACS and an alert message and error code have been sent to the Remote Center or operator console.
13	<b>SERVICE REQ<sup>2</sup></b>	Indicator	<p>Lights when the processor has detected an error in the LMU. The LMU does not operate under this condition.</p> <p><b>Note:</b> If this indicator is lit, contact Customer Support Services.</p>

**Notes:**

1. Numbers match the item numbers in [Figure 2-1 on page 2-2](#).
2. This appears on the LSM operator panel of an LSM that is attached to a 9315 EM.

**Figure 2-2. LSM Operator Panel Status Screen**



C40084

**Table 2-2. LSM Operator Panel Status Screen**

<b>Item <sup>1</sup></b>	<b>Category</b>	<b>Description</b>
1	Status	<p><b>FUNC : INIT</b></p> <p>Indicates that the LSM is performing initialization routines. These routines are performed when the LSM has been powered-on, when the access door has been closed, or when the <b>IPL</b> or the <b>RESET</b> switch has been pressed.</p> <p>When the panel shows FUNC : INIT, the display area shows diagnostic messages generated during initialization.</p> <p><b>FUNC : OFFL</b></p> <p>Indicates that the LSM is offline.</p> <p>When the panel shows FUNC : OFFL, the display area shows OFFLINE.</p> <p><b>FUNC : ONLN</b></p> <p>Indicates that the LSM is functioning and online.</p> <p>When the panel shows FUNC : ONLN, the display area shows status information about the CAPs and PCAP. Requests for you to perform an action are also shown here.</p>
2	Indicator	Identifies the LSM number in the ACS.
3	Indicator	Identifies the active LAN.
4	Indicator	Blinking heart indicates processor is active.

**Table 2-2. LSM Operator Panel Status Screen**

Item <sup>1</sup>	Category	Description
5	Status	<p>Shows the status of the CAPs and prompts you to perform enter or eject activities.</p> <p>CAP 0 is the standard CAP. The CAP 1 display area is active when the LSM uses the optional 30 cartridge CAP.</p> <p><b>LOCKED</b></p> <p>Lights when no CAP operations are in progress, or when the CAP doors are closed after an enter or eject operation.</p> <p>The following information is shown in the CAP status display area during enter and eject operations:</p> <p><b><i>Enter operations</i></b></p> <p><b>Load Cartridges - ENTER</b></p> <p>Lights when the CAP door is ready to be opened to place cartridges in the CAP magazines.</p> <p><b>Door Open</b></p> <p>Lights when the CAP door is opened.</p> <p><b><i>Eject operations</i></b></p> <p><b>Remove Cartridges - EJECT</b></p> <p>Lights when the CAP door is ready to be opened to remove cartridges from the CAP magazines.</p> <p><b>Door Open</b></p> <p>Lights when the CAP door is opened.</p> <p><b>Note:</b> These panel displays appear when the CAP is operated using commands entered at the operator console.</p> <p>For more information about operating the CAP in different modes and states, refer to your software user's guide.</p>

**Table 2-2. LSM Operator Panel Status Screen**

<b>Item <sup>1</sup></b>	<b>Category</b>	<b>Description</b>
6	Status	<p>Shows the status of the PCAP and displays prompts for you to perform enter or eject activities.</p> <p><b>LOCKED</b></p> <p>Lights when no PCAP operation is in progress or when the PCAP door is closed after an enter or eject operation.</p> <p>The following information is shown in the PCAP status display area during enter and eject operations:</p> <p><b><i>Enter operations</i></b></p> <p><b>Load Cartridge - ENTER</b></p> <p>Lights when the PCAP door is unlocked and ready to be opened to receive a cartridge.</p> <p><b>Door Open</b></p> <p>Lights when the PCAP door is opened.</p> <p><b><i>Eject operations</i></b></p> <p><b>Remove Cartridge - EJECT</b></p> <p>Lights when the PCAP door is ready to be opened to remove cartridges.</p> <p><b>Door Open</b></p> <p>Lights when the PCAP door is opened.</p>

**Table 2-2. LSM Operator Panel Status Screen**

<b>Item <sup>1</sup></b>	<b>Category</b>	<b>Description</b>
7	Indicator	<p>Rectangular boxes show the number and location of magazines in the CAP. If the top magazines are not in CAP 0 or CAP 1, the boxes for those magazines are not shown. If the bottom magazines are not in CAP 0 or CAP 1, the display does not show any boxes, even if the top magazines are in place. This is because the robot audits the CAP by starting at the bottom of the CAP, and stops performing the audit when no magazine is found.</p> <p>Horizontal lines within the boxes show the number and location of cartridges in each magazine.</p> <p>During cartridge enter operations, this display increments after cartridges have been entered into the CAP, the door is closed, and the robot catalogs the CAP. It decrements as cartridges are removed from the CAP.</p> <p>During eject operations, this display increments as cartridges are placed in the CAP for ejection.</p> <p>Question marks in the boxes indicate the CAP door had been opened and the status of cartridges in the CAP is unknown.</p>
8	Indicator	<p>The numbers next to CAP 1 and CAP 0 indicate the number of cartridges in the CAPs.</p> <p>During cartridge enter operations, this display field increments after cartridges have been entered into the CAP, the door is closed, and the robot catalogs the CAP. It decrements as the cartridges are removed from the CAP.</p> <p>During cartridge eject operations, this field increments as cartridges are placed in the CAP for removal.</p>
9	Indicator	<p>The rectangular box next to PCAP shows a dash when a cartridge is present in the PCAP. The box is blank when no cartridge is present.</p> <p>The field above the rectangular box displays the volume serial number of the cartridge being entered or ejected through the PCAP, if it has a readable label. If the cartridge is unlabeled, or if the label cannot be read, CANT READ is displayed.</p>

**Table 2-2. LSM Operator Panel Status Screen**

Item <sup>1</sup>	Category	Description
10	Softkey	<p>The second softkey from the left is not implemented.</p> <p><b>CONTINUE</b></p> <p>During initialization diagnostics, this switch clears a nonfatal diagnostic failure condition and allows initialization to continue.</p> <p><b>LIGHTS</b></p> <p>Toggles the two LSM ceiling lights on and off. The switch on the TWS card must be in position 3 to activate this.</p> <p><b>LSM INFO</b></p> <p>Displays the level of microcode installed. Press DONE when finished.</p> <p><b>LCD CONFIG</b></p> <p>Adjusts the intensity of the display panel. When this switch is pressed, the StorageTek logo appears on the panel and Adjust LCD Brightness appears above the logo. Lighter, Darker, and DONE appear at the bottom of the display with a switch for each option. Keep pressing the lighter or darker switch to adjust the display to the desired intensity. Press DONE when complete. The normal display panel is restored.</p>

**Notes:**

1. Numbers match the item numbers in [Figure 2-2 on page 2-5](#).

## Cartridge Drive Operator Panel

Different drive types use different techniques to display messages and provide operator interaction. The following pages provide insight to the techniques.

### 4xxx Operator Panel

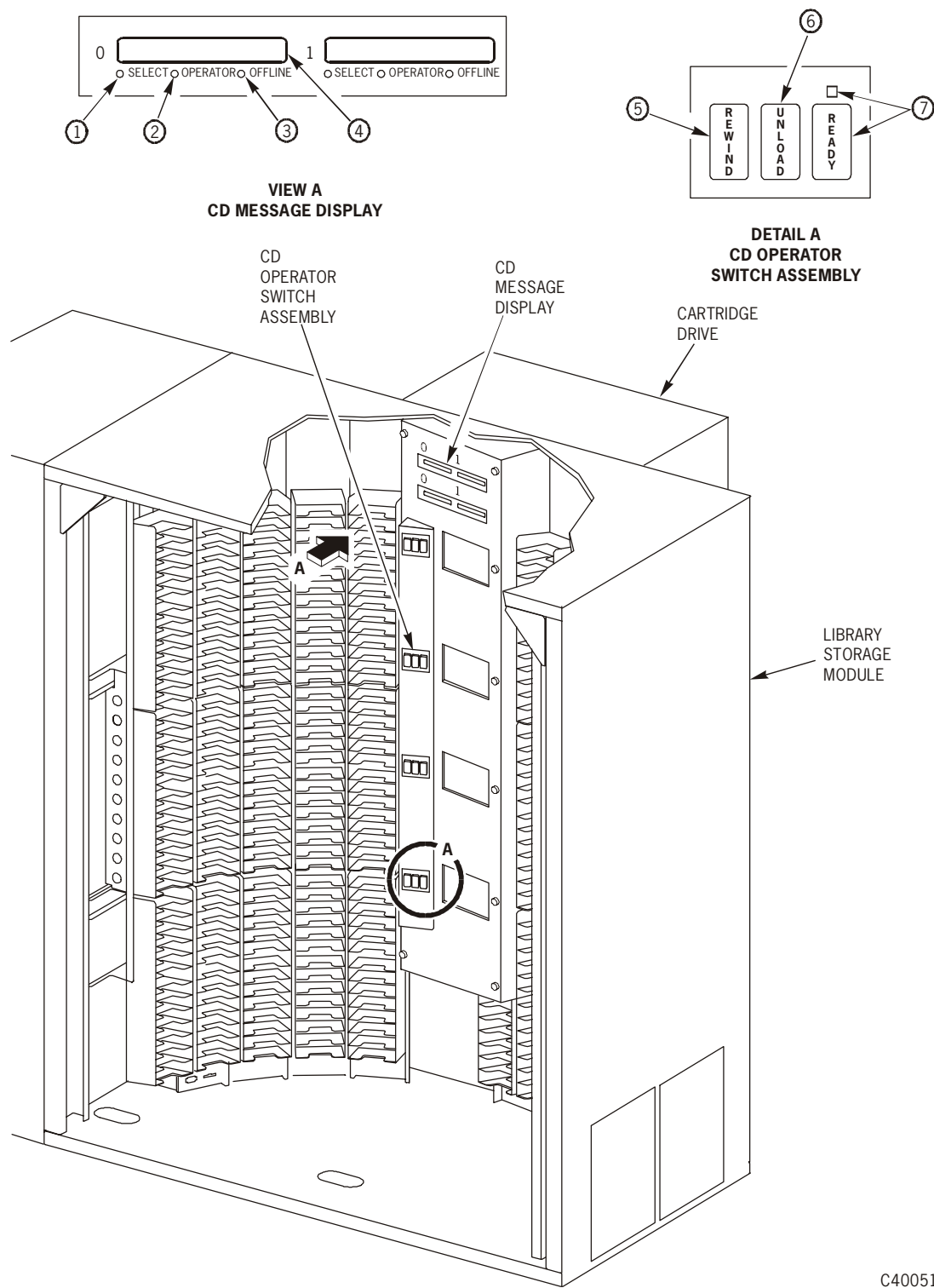
The 4xxx CD operator panel inside the LSM contains CD operator switch assemblies and a CD message display. Indicators are enabled when the LSM is offline, and disabled when the LSM is online. Refer to your software user's guide for a description of using a CD when the LSM is offline.

[Figure 2-3 on page 2-11](#) shows switch and display locations.

[Table 2-3 on page 2-12](#) describes each numbered item.



**Figure 2-3. 4xxx CD Message Display and Operator Switch Assembly**



C40051

**Table 2-3. 4xxx CD Message Display and Operator Switch Assembly**

Item <sup>1</sup>	Label	Type	Function
1	<i>SELECT</i>	Green Light Bar	When lit, the transport is selected by the control unit.
2	<i>OPERATOR</i>	Red Light Bar	Flashes on and off when you need to perform an action.
3	<i>OFFLINE</i>	Yellow Light Bar	Lit when the transport <b>OFFLINE</b> switch is pressed. This places the transport physically offline.
4		10-character alphanumeric display	Displays transport messages. In a host software component environment, it also displays host messages.
5	<b>REWIND</b>	Momentary Switch	<p>Verify that the <b>READY</b> LED is not lit. Then press this momentary switch to rewind the tape into a cartridge as far as the logical BOT (beginning-of-tape). The <b>READY</b> switch must be pressed and the LED must light before another cartridge can be loaded.</p> <p>In an LSM that is offline, press this switch and the <b>UNLOAD</b> switch at the same time, for two seconds when the transport is ready, to activate the transport message display.</p> <p>When the transport is ready, use the <b>REWIND</b> and <b>UNLOAD</b> switches to adjust the intensity of the message display. Press both switches at the same time and the display increases to the next level of intensity every two seconds. The intensity increments in intervals from off to 25%, 50%, and 100%. Release both switches when you have the desired intensity.</p>
6	<b>UNLOAD</b>	Momentary Switch	<p>Verify that the <b>READY</b> LED is not lit. Then press this momentary switch to rewind a tape completely into a cartridge, release the leader block, and raise the transport elevator so the cartridge can be removed.</p> <p>The <b>READY</b> switch must be pressed and the LED must light before another cartridge can be loaded.</p>

**Table 2-3. 4.xxx CD Message Display and Operator Switch Assembly (Continued)**

Item <sup>1</sup>	Label	Type	Function
7	<b>READY</b>	Momentary Switch	Switch: Press this switch to set and reset the ready enable switch.
		Green LED	Indicator: Lit when the ready enable switch is set.  When the ready state is set, the transport is ready and the LED is lit. When the ready state is not set and the LED is not lit, the transport is prevented from becoming ready.  <b>Note:</b> Make sure the <i>READY</i> indicator is lit for each transport before leaving the LSM and placing it online for automated operations.

**Notes:**

1. Numbers match item numbers in [Figure 2-3 on page 2-11](#).

## 9490 and SD-3 Operator Panel

9490 and SD-3 CTUs have a panel above the transport which integrates the display, switches, and indicators into a single unit.

It has all of the switches and indicators of the 4xxx drives, but has two additional indicators.

Indicator	Description
<i>CLEAN</i>	Indicates when the transport needs to be cleaned. A cleaning cartridge should be loaded at the next opportunity.  The indicator goes off when the cleaning cycle is complete.
<i>CRTG LOADED</i>	Indicates a cartridge tape is loaded in the transport

## 9840 and T9940 Operator Panel

9840 and T9940 drives have an operator panel below the cartridge slot. This panel contains the display, four indicators, and four switches.

Item	Description
<i>activity</i>	When on constantly, indicates tape is loaded and the drive is ready. When flashing, tape is moving in the drive.
<i>clean</i>	Indicates when the drive needs to be cleaned. A cleaning cartridge should be loaded at the next opportunity.
<b>IPL</b>	Pressing this switch causes an IPL and resets the drive.
<b>Menu</b>	Pressing this switch accesses the menu system, the menus, and submenus.
<i>power</i>	When on constantly, indicates power on and IPL completed successfully.
<i>service</i>	When on constantly, indicates a hardware error was detected and the drive is not functional.
<b>Select</b>	Pressing this switch while in the Main Menu selects the displayed choice or advances to a sub-menu.
<b>Unload</b>	Pressing this switch rewinds tape in the cartridge and ejects the cartridge from the drive.

Refer to the *9840 Tape Drive User's Reference Manual*, 95739, or the *T9940 Tape Drive Operator's Guide*, 95989, for additional information.

## ■ Emergency Power-Off Switches

**Note:** Use the EPO switch only in an emergency.

In an emergency, you can remove power immediately from the LSM and LCU, the LMU, and the cartridge subsystem.

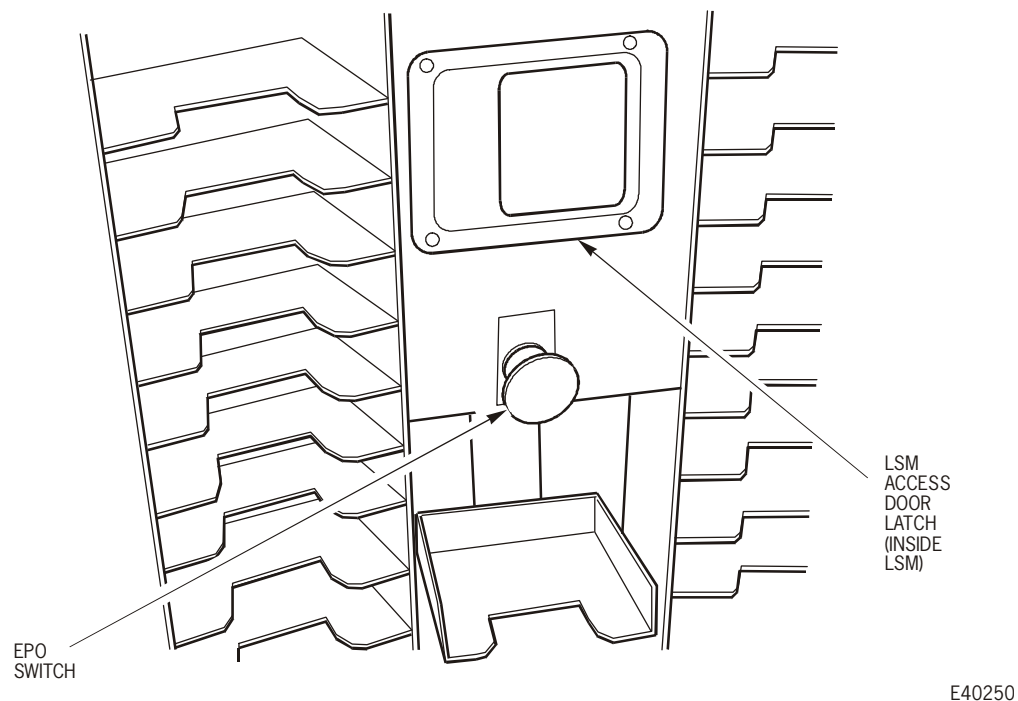
### LSM EPO Switches

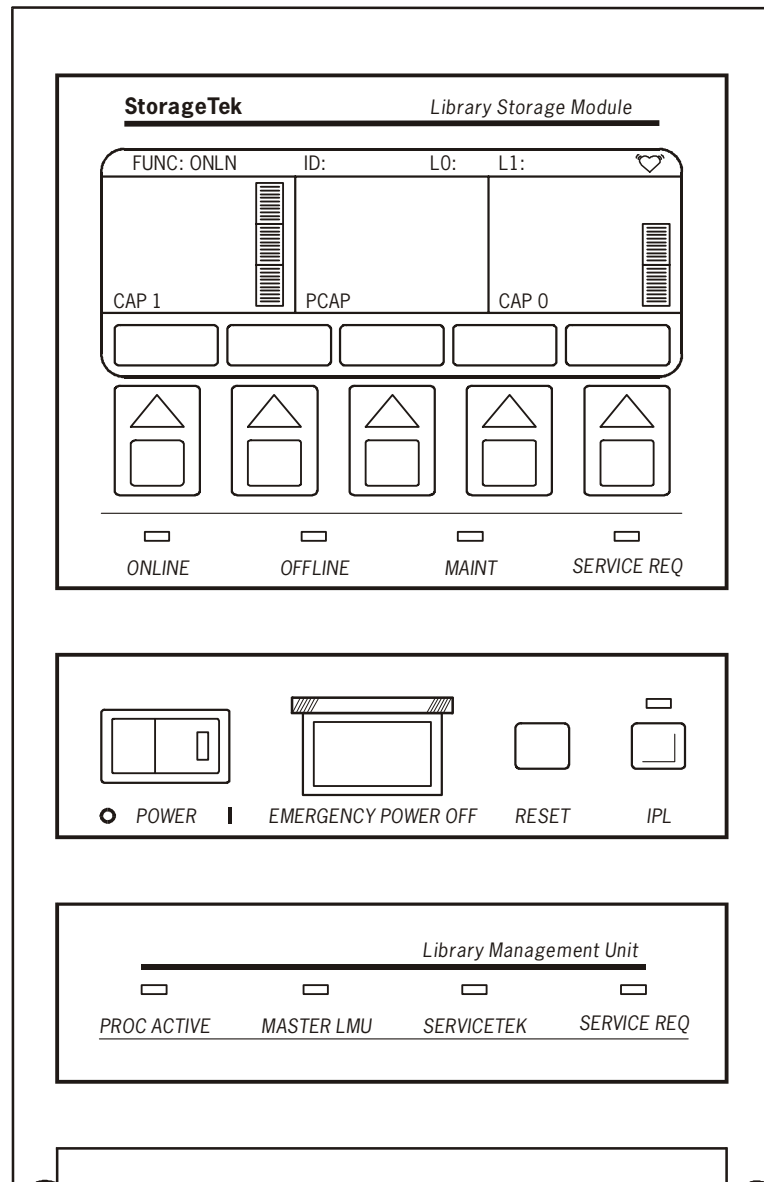
The LSM has two red **EPO** switches. One switch is on the inside of the access door, as shown in [Figure 2-4](#); the other switch is on the LSM operator panel, as shown in [Figure 2-5 on page 2-16](#). Both switches remove power from all moving parts of the robot and the LCU.

**Note:** A person accidentally inside the LSM during power on can use the **EPO** switch on the inside of the access door to immediately power off the LSM.

See the instructions at [“Emergency Powering off” on page 3-6](#).

**Figure 2-4. LSM Internal EPO Switch**



**Figure 2-5. LSM Operator Panel EPO Switch**

C40356

## LMU Power Switch

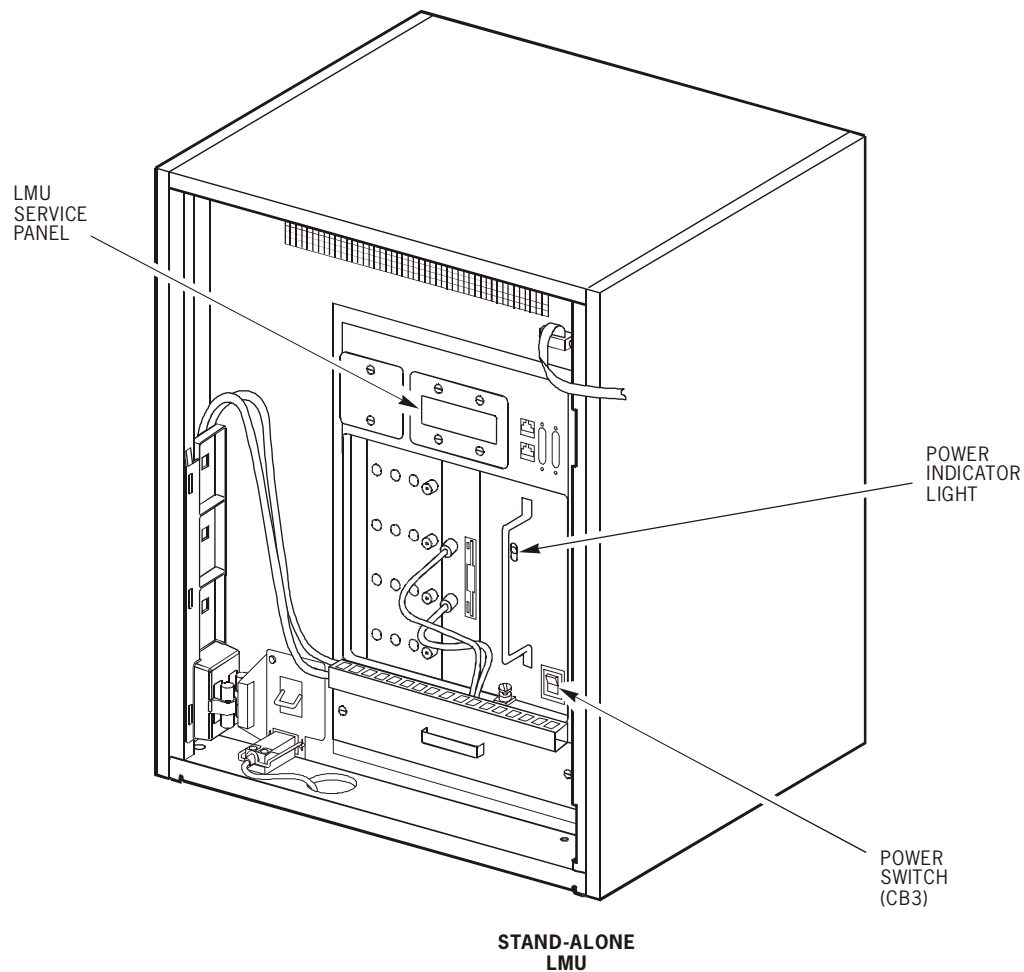
**Note:** Use the LMU power switch only in an emergency.

See [Figure 2-6](#) for the location of the power switch.

**Note:** Some 9330 LMUs and 9315 EMs require a tool to open the front doors. Contact Customer Support Services if the unit needs to be opened.

See the instructions at [“Emergency Powering off” on page 3-3](#).

**Figure 2-6. 9330 LMU Power Switch**



## Cartridge Subsystem EPO Switch

**Note:** The 9840/T9940 drive does not have an EPO switch.

### 4xxx EPO Switch

**Note:** Use the EPO switch only in an emergency.

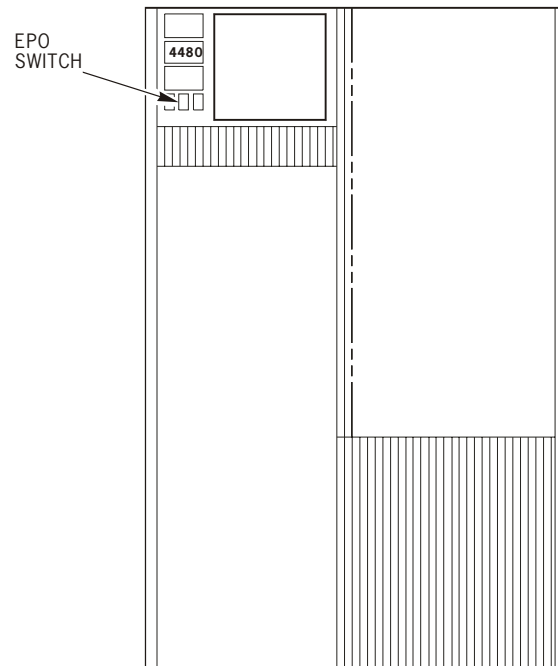
See [Figure 2-7](#) for the location of the **EPO** switch on the control unit.

Pressing this switch immediately removes all power from the AC and DC power supplies, and from the attached cartridge drives.

**Note:** This switch starts an uncontrolled power off and might cause a loss of data.

See the instructions at [“4480/4490 Cartridge Subsystem” on page 3-7](#).

**Figure 2-7. Cartridge Subsystem EPO Switch**



C40357



## 9490 and SD-3 Unit Emergency Switch

**Note:** Use the Unit Emergency switch only in an emergency.

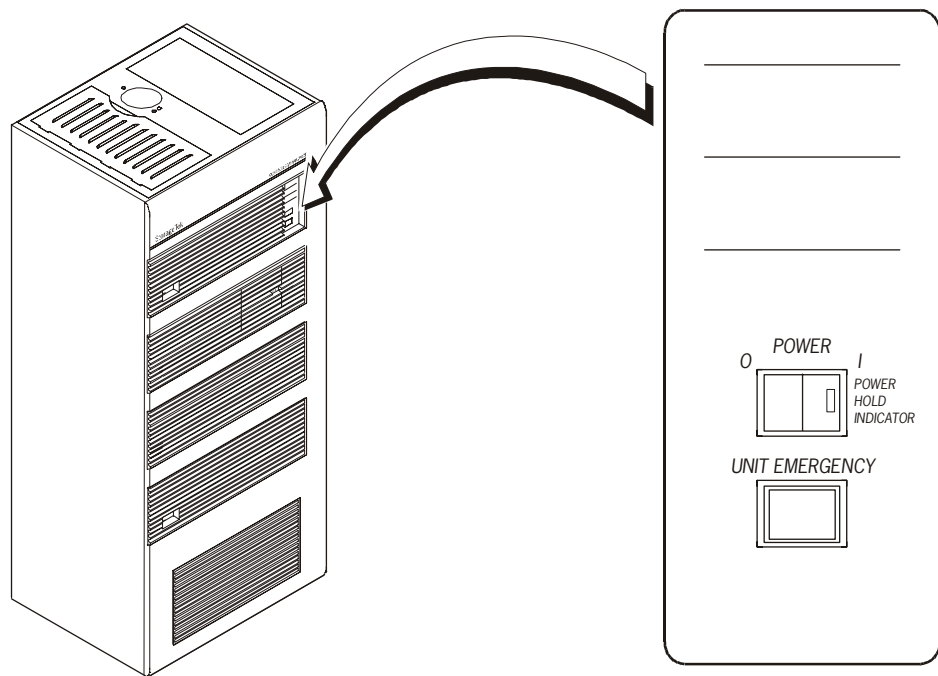
See [Figure 2-8](#) for the location of the **Unit Emergency** switch on the rear of the cartridge drive.

Pressing this switch immediately powers off the cartridge drive and *all* controller transport units.

**Note:** This switch starts an uncontrolled power off and might cause a loss of data.

See the instructions at [“9490 and SD-3 Cartridge Drive”](#) on page 3-8.

**Figure 2-8. Cartridge Drive Power Control Panel**



C40899

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This chapter contains the procedures for:

- [“Displaying LMU and LSM Status”](#)
- [“Powering on and Powering off the LMU”](#)
- [“Powering on and Powering off the LSM” on page 3-4](#)
- [“Powering off the Cartridge Subsystem” on page 3-7](#)
- [“Operating in Automated Mode” on page 3-9](#)
- [“Operating in Manual Mode” on page 3-17](#)

## ■ Displaying LMU and LSM Status

Refer to your software user’s guide and enter the command at the operator console to display:

- Current status of the Library Storage Modules (LSMs)
- Current status of the Library Management Unit (LMU)
- Online, offline, or standby status of each LMU station or port

## ■ Powering on and Powering off the LMU

The following pages describe how to power on and power off the LMU in those units that allow customer access.

**Note:** Some 9330 LMUs and 9315 Electronic Modules (EMs) require a tool to open the front doors. The panels and switches in these units are never accessible to operators. Electrical components in the units can cause serious injury. Contact Customer Support Services if the unit needs to be opened.

If the front door of your unit does not require a tool to open, you may perform these procedures:

- [“Powering on” on page 3-2](#)
- [“Powering off” on page 3-2](#)
- [“Emergency Powering off” on page 3-3](#)

## Powering on

To power on the LMU:

1. Open the front door of the 9330 LMU or 9315 EM.
2. Press the power switch on the LMU, as shown in [Figure 3-1 on page 3-3](#).
  - The power indicator on the front of the LMU turns on.
  - The LMU performs a series of diagnostic routines and the service panel displays selftest and booting information.
  - The *HARD DISK ACTIVE* indicator turns on.
  - The *PROCESSOR ACTIVE* indicator turns on.
3. Refer to your software user's guide and make sure that the ACS is ready to bring online.

**Note:** If the LMU does not power on, contact Customer Support Services and report the problem.

## Powering off

**CAUTION:**  
**LOSS OF TAPE MOUNT REQUESTS. MAKE SURE LSMs AND ACS ARE OFFLINE BEFORE POWERING OFF THE LMU.**

To power off the LMU:

1. Refer to your software user's guide and place the LSMs offline.
2. Stop all tape activity and place the ACS offline.
3. Open the front door of the 9330 LMU or 9315 EM.
4. Press the power switch on the LMU.

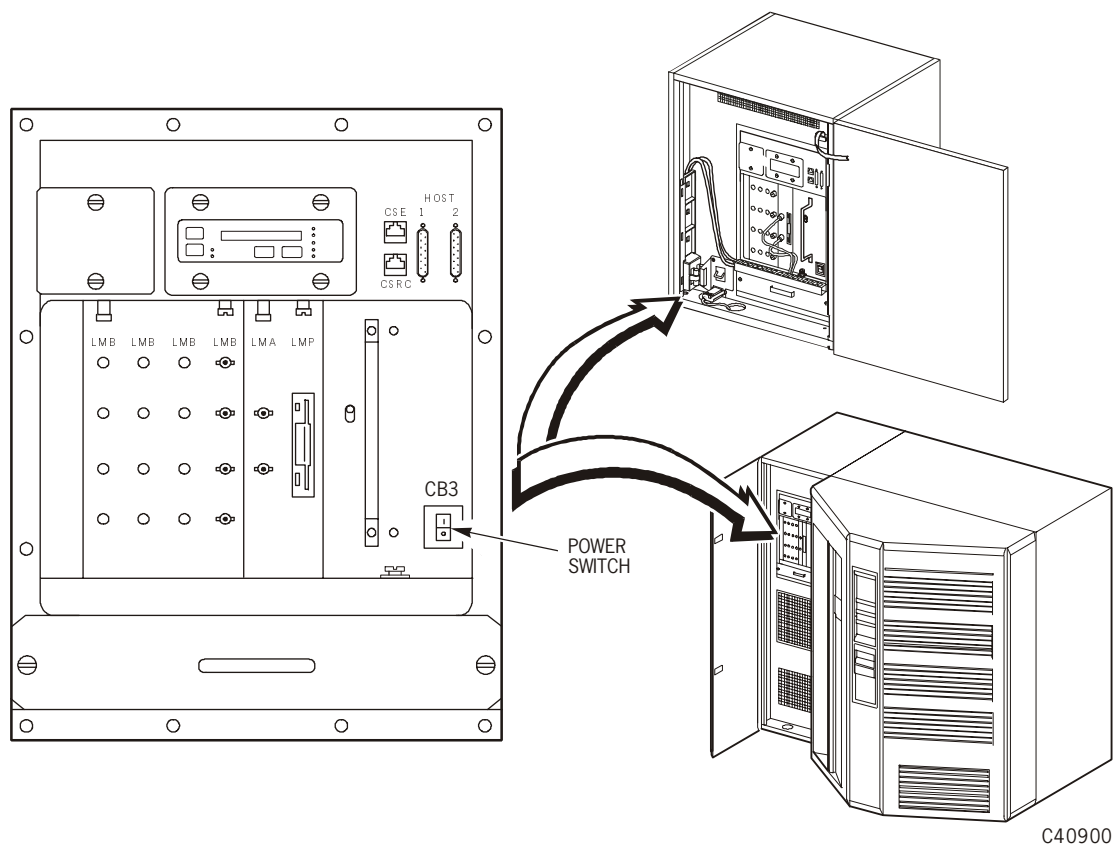
## Emergency Powering off

**Note:** Use the following procedure only in an emergency.

To power off the LMU in an emergency:

1. Open the front door of the 9330 LMU or 9315 EM.
2. Press the power switch on the LMU as shown in [Figure 3-1](#).
3. Notify Customer Support Services to dispatch a service representative to restore power to the LSM as described in [Chapter 4, “Obtaining Support.”](#)

**Figure 3-1. LMU Power Switch**



## ■ Powering on and Powering off the LSM

The following pages describe how to power on and power off the LSM. The pages also provide IPL and emergency power off procedures.

### Powering on

When power is applied to the LSM, the functional microcode on the LMU hard drive is downloaded from the LMU to the LCU. The microcode controls the robot. The LSM will not operate without this code.

**Note:** The LMU must be powered on for the code to be downloaded to the LCU.

To power on the LSM:

1. Press the **POWER** switch on the LSM operator panel. See [Figure 3-2 on page 3-5](#).

- The panel displays PROM and boot diagnostic routines.
- The panel displays OFFLINE when the diagnostic and initialization routines are complete.

**Note:** If the LSM does not power on, contact Customer Support Services and report the problem.

2. Refer to your software user's guide and place the LSM online to perform automated operations.

### Powering off

To power off an LSM:

1. Refer to your software user's guide and place the LSM offline.

The panel displays OFFLINE.

2. Press the **POWER** switch on the LSM operator panel. See [Figure 3-2 on page 3-5](#).

### IPLing

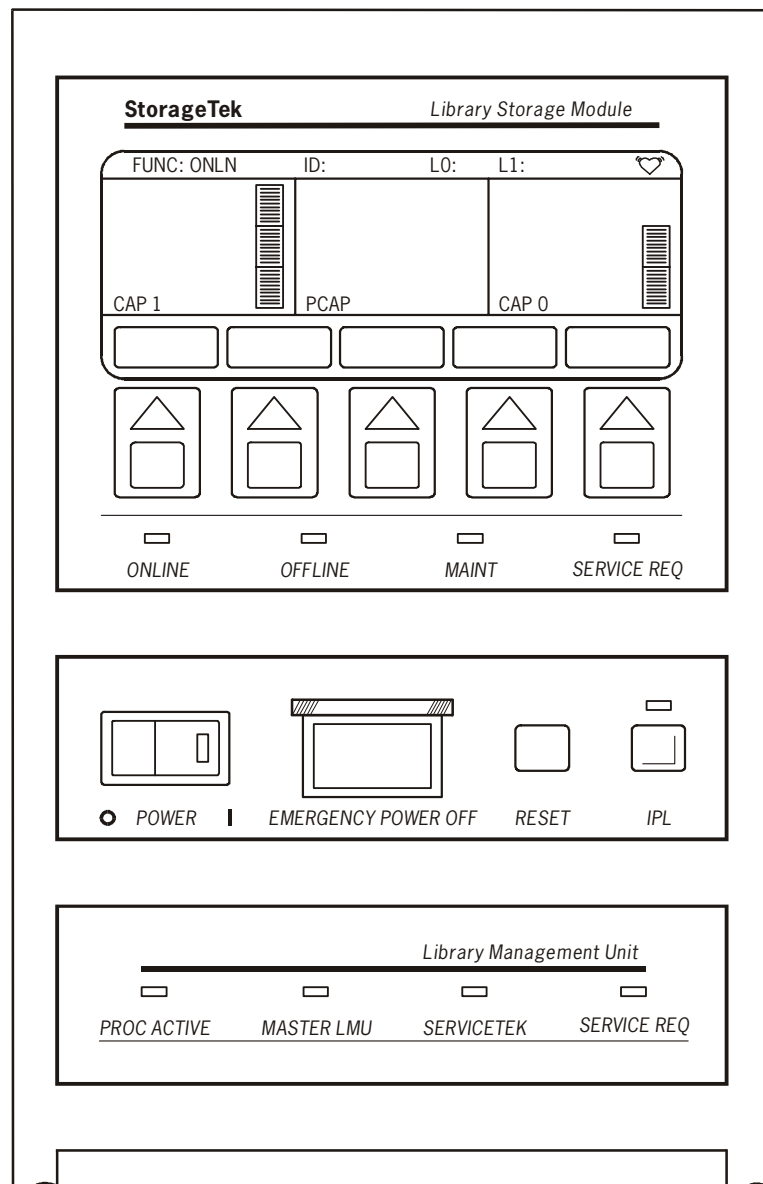
When an IPL is performed on the LSM, the microcode is downloaded from the LMU to the LCU, and the LSM performs a full initialization routine.

**To IPL an LSM:**

1. Refer to your software user's guide and place the LSM offline.
2. Press the **IPL** switch on the LSM operator panel. See [Figure 3-2 on page 3-5](#).

- The panel displays PROM and boot diagnostic routines.
- The panel displays Loading functional code.
- The LSM performs an initialization routine.
- The panel displays OFFLINE when the IPL is complete.

**Figure 3-2. LSM Operator Panel Switches**



C40356

3. Refer to your software user's guide and place the LSM online to perform automated operations.

When the LSM IPL is complete, the LSM establishes communication with the LMU. The LSM must be placed online to perform automated operations.

## Emergency Powering off

**Note:** Use the following procedure only in an emergency.

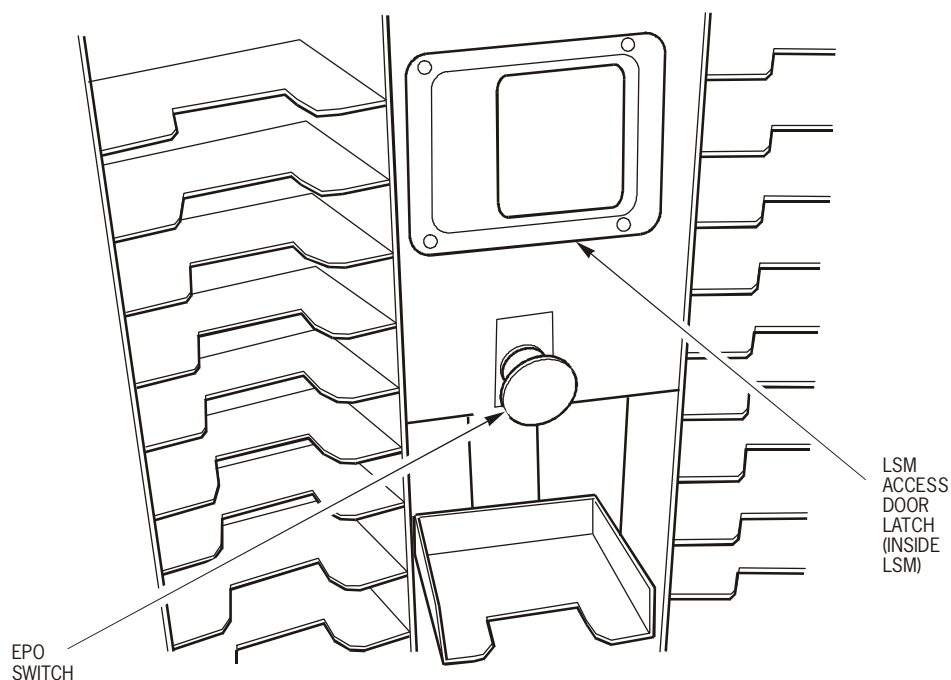
To power off an LSM in an emergency:

1. Press the **EMERGENCY POWER OFF** switch on the LSM operator panel (Figure 3-2 on page 3-5), or the **EPO** switch on the inside of the LSM access door (Figure 3-3).

**Note:** This action immediately removes all power from the robot and the LCU.

2. Notify Customer Support Services to dispatch a service representative to restore power to the LSM as described in Chapter 4, "Obtaining Support."

**Figure 3-3. LSM Internal EPO Switch**



E40250



## ■ Powering off the Cartridge Subsystem

**Note:** The 9840/T9940 drive power switch is not accessible because the drive is located inside a locked cabinet.

### 4480/4490 Cartridge Subsystem

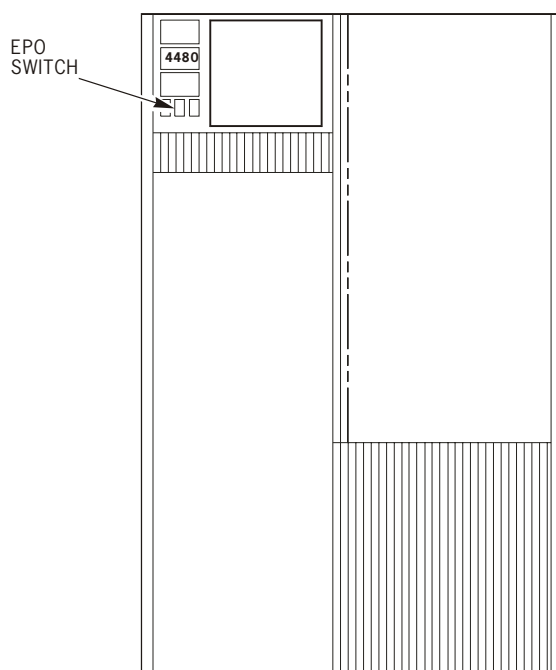
**CAUTION:**

**LOSS OF DATA.** Pressing the EPO switch starts an uncontrolled power off and might cause a loss of data. **USE THE EPO SWITCH ONLY IN AN EMERGENCY.**

To power off a cartridge subsystem in an emergency:

1. Press the **EPO** switch on the control unit, as shown in [Figure 3-4](#).
2. Notify Customer Support Services to dispatch a service representative to restore power to the subsystem as described in [Chapter 4, “Obtaining Support.”](#)

**Figure 3-4. Cartridge Subsystem EPO Switch**



C40357

## 9490 and SD-3 Cartridge Drive

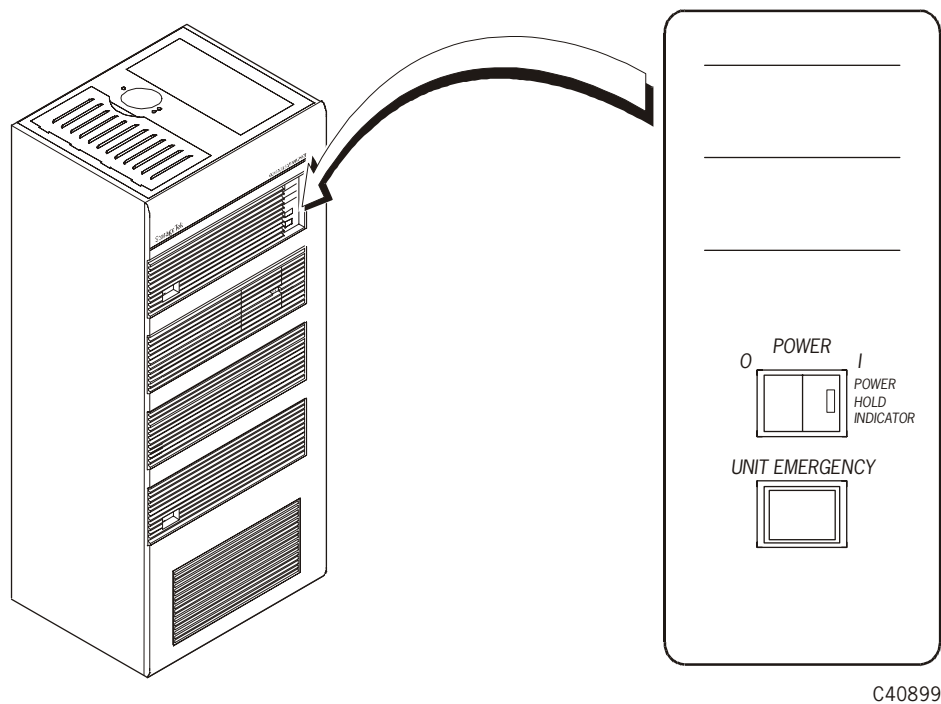
**CAUTION:**

**LOSS OF DATA.** Pressing the Unit Emergency switch starts an uncontrolled power off and might cause a loss of data. **USE THE UNIT EMERGENCY SWITCH ONLY IN AN EMERGENCY.**

To power off a cartridge drive in an emergency:

1. Locate the **Unit Emergency** switch on the power control panel at the rear of the cartridge drive.
2. Lift the plastic cover to allow access to the switch.
3. Press the red **Unit Emergency** switch, shown in [Figure 3-5](#).
4. Notify Customer Support Services to dispatch a service representative to restore power to the subsystem as described in [Chapter 4, “Obtaining Support.”](#)

**Figure 3-5. Unit Emergency Switch**



## ■ Operating in Automated Mode

When the LSM is online and the robot is mounting and dismounting cartridges, you should monitor console messages and respond appropriately to make sure that the library continues to operate efficiently.

You might find the following list of procedures helpful:

- [“Entering Cartridges through the CAP” on page 3-10](#)
- [“Ejecting Cartridges through the CAP” on page 3-13](#)
- [“Entering Cartridges through the PCAP” on page 3-14](#)
- [“Ejecting Cartridges through the PCAP” on page 3-16](#)

**Note:** The operation steps and panel displays listed in the following pages describe how the CAP and PCAP operate when enter and eject commands are issued at the operator's console.

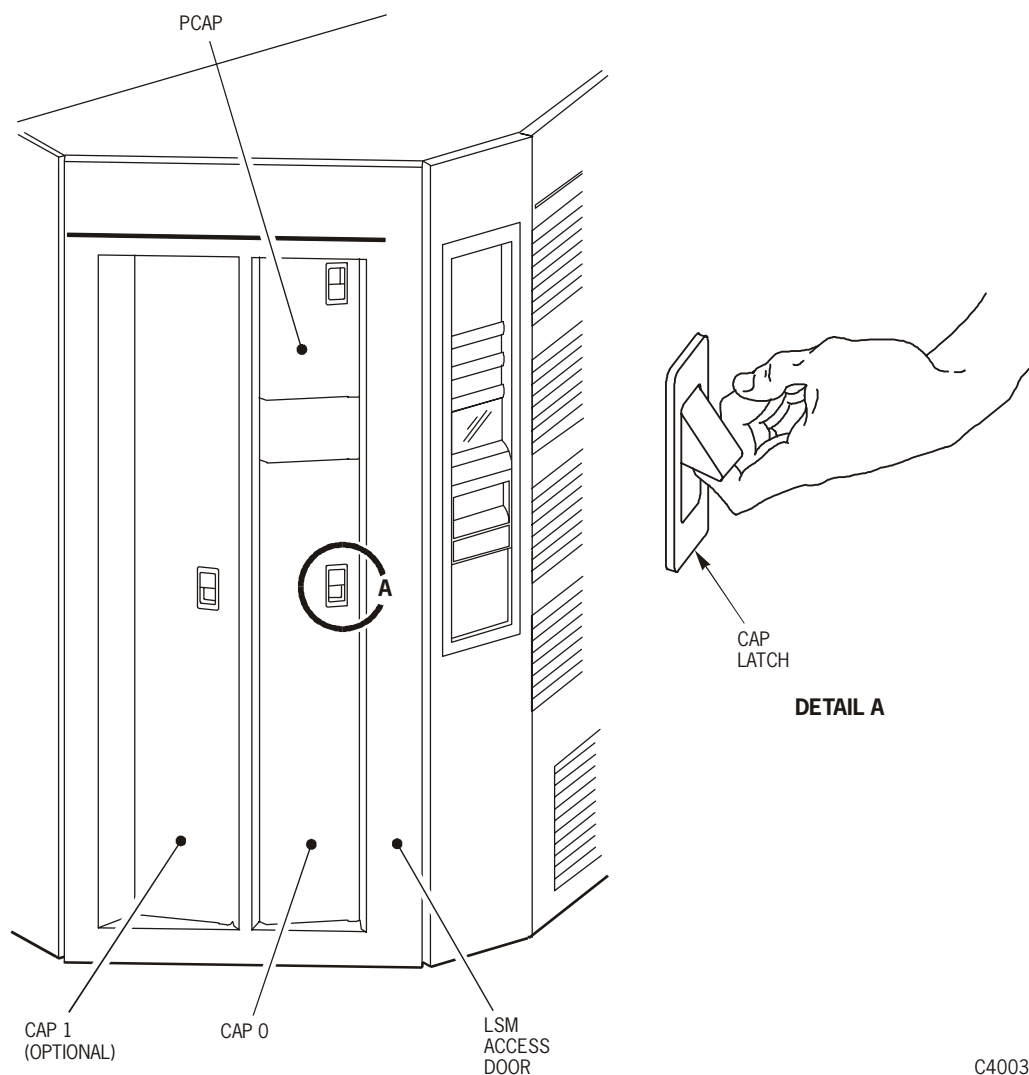
Refer to your software user's guide for the command syntax for the enter and eject commands and for more information about operating the CAP and PCAP in different modes and states.

## Entering Cartridges through the CAP

To enter cartridges through the CAP:

1. Issue the enter command at the operator console.
  - The CAP status display area on the LSM operator panel displays ENTER.
  - The CAP door unlocks.
2. Open the CAP door by pulling the CAP latch as shown in [Figure 3-6](#).
  - The panel displays Door Open, indicating that the CAP is open.

**Figure 3-6. Opening the Cartridge Access Port**



C40039

3. Remove the CAP magazines from the LSM door. Lift the magazines up approximately 25.4 mm. (1 in.) and pull them out, as shown in [Figure 3-7](#).

**Note:** You can also add cartridges directly to the magazine cells without removing the magazines from the CAP.

4. Place a cartridge into a magazine cell as shown in [Figure 3-8 on page 3-12](#).

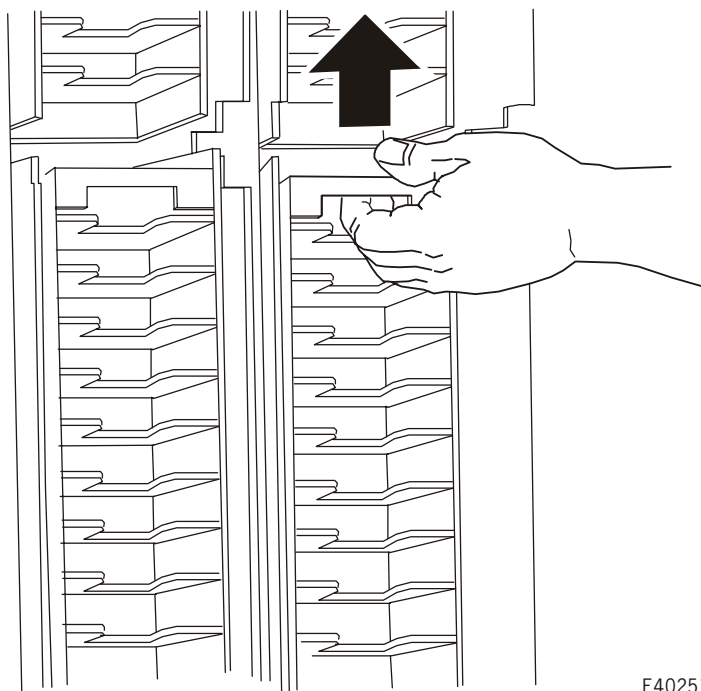
**Note:** Insert cartridges so they lie flat, with the customer label on top and the volume serial number (VOLSER) facing you as shown in [Figure 3-8 on page 3-12](#).

5. Continue until all the cartridges have been placed in the magazines, or until the magazines are full.
6. Place the magazines back into the CAP.

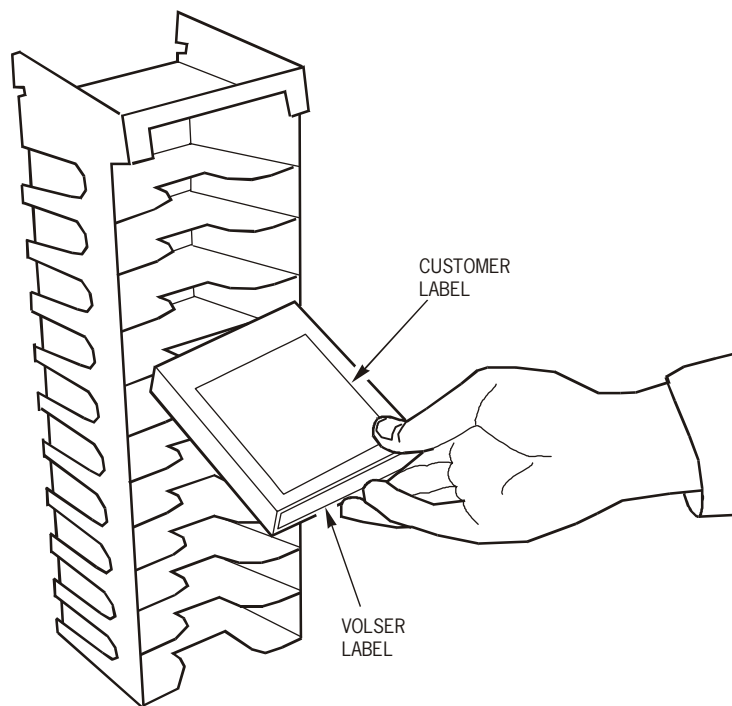
**Note:** Make sure that a magazine is *always* placed into the bottom magazine area. You do not need to replace the top magazines unless you need them.

If only the bottom magazine is replaced, the status display for the CAP on the LSM operator panel shows only the bottom magazine is present. If only the top magazines are replaced in either the standard or optional CAP, the status display for the CAPs shows that no magazines are present, and the robot does not attempt to retrieve a cartridge from the CAP.

**Figure 3-7. Removing Cartridge Access Port Magazines**



E40251

**Figure 3-8. Placing Cartridges into Magazine Cells**

E40252

7. Close the CAP door.

- The panel displays LOCKED when the CAP door is closed and locked properly.
- The rectangular boxes on the panel show horizontal dashes as the robot catalogs the CAP. The dashes indicate the number and location of cartridges in the CAP magazines. The two-digit display field next to the boxes also shows the number of cartridges placed in the CAP.
- The robot stores all cartridges with readable labels.
- The number of dashes in the rectangular boxes and the two-digit value on the panel are reduced as the cartridges are removed from the CAP.

**Note:** The robot's ability to move cartridges with unreadable labels or to move cartridges placed in the CAP incorrectly, depends on the way the Nearline software is configured.

Under normal conditions, when a cartridge is placed in the CAP incorrectly or with an unreadable label, the robot audits the CAP, displays a dash in the rectangular box in the CAP status display area on the LSM operator panel, recognizes that a cartridge is present in the CAP, but does not move it.

You must remove the cartridge from the CAP.

8. Refer to your software user's guide and restore the CAP to the locked position.

## Ejecting Cartridges through the CAP

To eject cartridges through the CAP:

1. Issue the eject command at the operator console.
  - The CAP status display area on the LSM operator panel displays EJECT.
  - The robot places cartridges into the CAP until all specified cartridges are in the CAP or all CAP cells are filled.
  - The rectangular boxes on the panel show a dash as each cartridge is placed in the CAP. The dashes show the number and location of cartridges in the CAP magazines. The two-digit display field next to the boxes also shows the number of cartridges placed in the CAP.
2. Open the CAP door.
  - The panel displays Door Open.
3. Remove all loaded magazines from the CAP and take the cartridges out of the magazines.

### Notes:

1. You can also remove individual cartridges from the magazines.
2. Do not leave cartridges in the CAP or the panel will display Remove Cartridges.
4. Place the magazines back into the CAP.
 

**Note:** Make sure that the bottom magazine is placed in the CAP.
5. Close the CAP door.
  - The panel displays LOCKED when the CAP door is closed and locked properly.

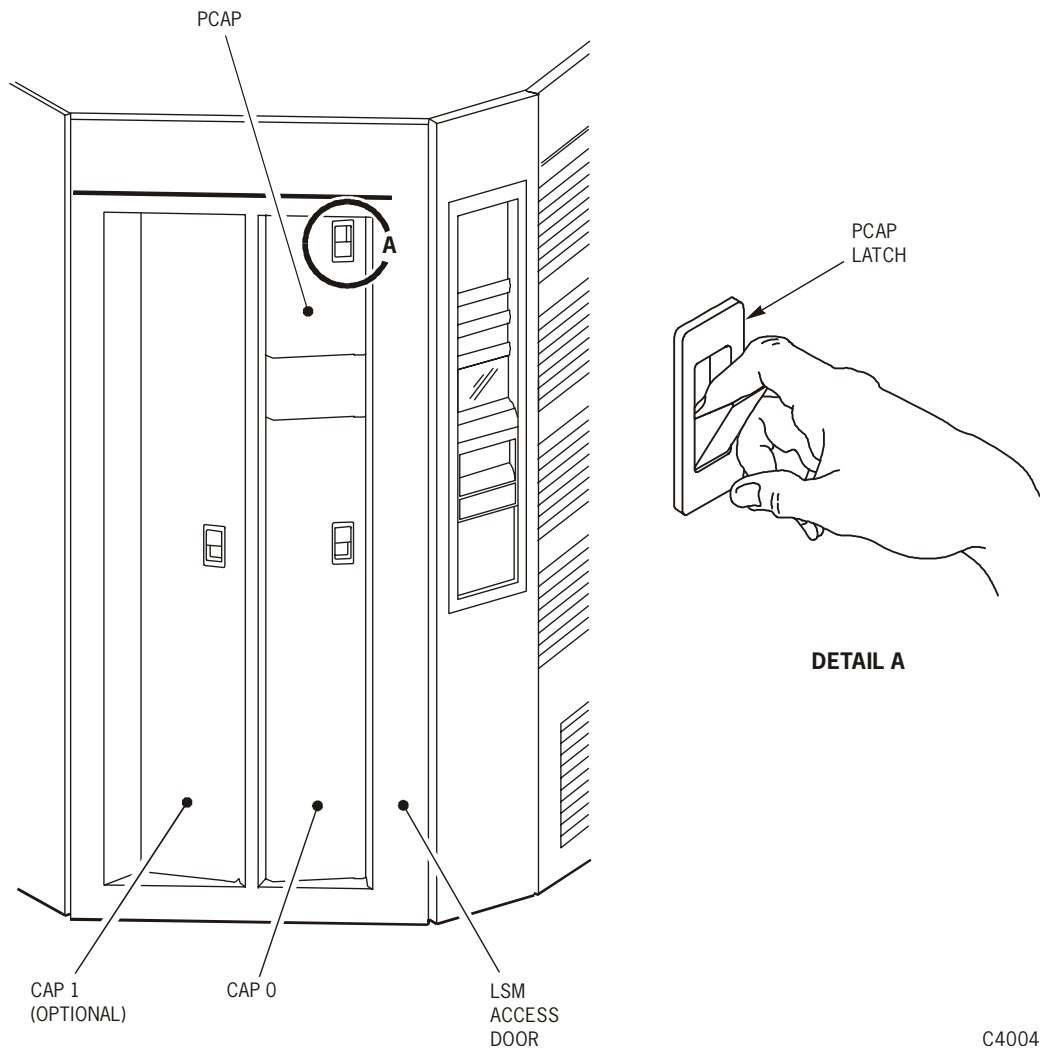
The robot continues filling the CAP until all the required cartridges have been ejected. When the panel displays Remove Cartridges EJECT, repeat steps 2 through 5.

## Entering Cartridges through the PCAP

To enter cartridges through the PCAP:

1. Issue the enter command at the operator console.
  - The PCAP status display area on the LSM operator panel displays ENTER.
2. Open the PCAP door as shown in [Figure 3-9](#).
  - The panel displays Door Open.

**Figure 3-9. Priority Cartridge Access Port, Closed**



C40040



3. Place the cartridge into the PCAP as shown in [Figure 3-10](#).

**Note:** Insert the cartridge so that it lies flat, with the customer label on top and the VOLSER facing you.

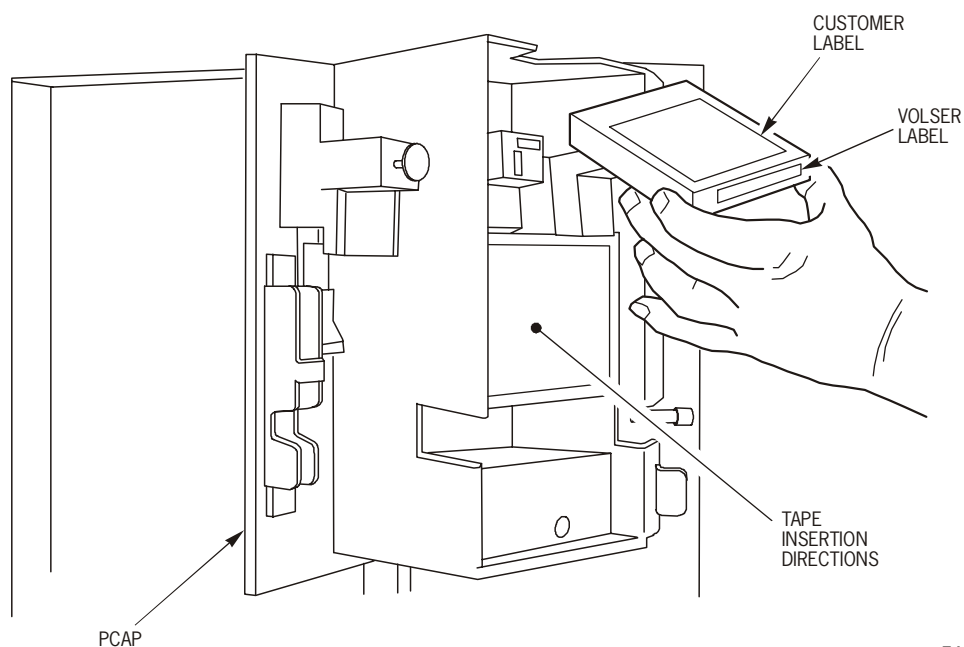
4. Close the PCAP door.

- The panel displays LOCKED.
- The panel displays ??????, indicating that the VOLSER is unknown.
- As the robot audits the PCAP, the panel displays the VOLSER of the cartridge entered and shows a dash in the rectangular box, indicating that a cartridge is present in the PCAP.

**Note:** The robot does not move a cartridge with an unreadable label or a cartridge placed in the PCAP incorrectly. When this occurs, the panel displays CANT READ and you must remove the cartridge.

5. Refer to your software user's guide and restore the PCAP to the locked position.

**Figure 3-10. Placing the Cartridge into the PCAP**



E40041

## Ejecting Cartridges through the PCAP

To eject a cartridge through the PCAP:

1. Issue the eject command at the operator console.
  - The robot places the cartridge into the PCAP.
  - The robot audits the PCAP.
  - The PCAP status display area on the LSM operator panel displays the VOLSER of the cartridge.
  - A dash in the rectangular box appears in the display area and indicates that a cartridge is present.
  - The panel displays CANT READ if the cartridge is unlabeled or if the label is unreadable.
2. Open the PCAP door as shown in [Figure 3-9 on page 3-14](#).
  - The panel displays EJECT.
3. Remove the cartridge from the PCAP.
4. Close the PCAP door.
  - The panel displays LOCKED.
  - The VOLSER is replaced by ?????? on the panel.
  - The robot audits the PCAP and replaces the question marks with a blank field, indicating that the status is known and that no cartridge is present.

## ■ Operating in Manual Mode

The following pages contain operations you can perform when the LSM is in manual mode.

Before starting any of these operations, you must take precautions against electrostatic discharge (ESD).

**Note:** Even a small electrostatic discharge could damage an electrical component inside the library. A damaged component might not fail immediately, but over time, it will become worse, possibly causing an intermittent problem.

### Entering the LSM

To safely enter the LSM:

1. Place the LSM offline.

The LSM operator panel displays OFFLINE when the LSM is offline and not performing automated operations.

**CAUTION:**

**LOSS OF MOUNT REQUESTS. If you open the lock access door (LAD) when the LSM is online, a switch is activated which automatically causes a software interrupt and stops the robot. MAKE SURE THE LSM IS OFFLINE BEFORE OPENING THE LAD.**

2. Open the LAD as shown in [Figure 3-11 on page 3-18](#) and [Figure 3-12 on page 3-19](#).

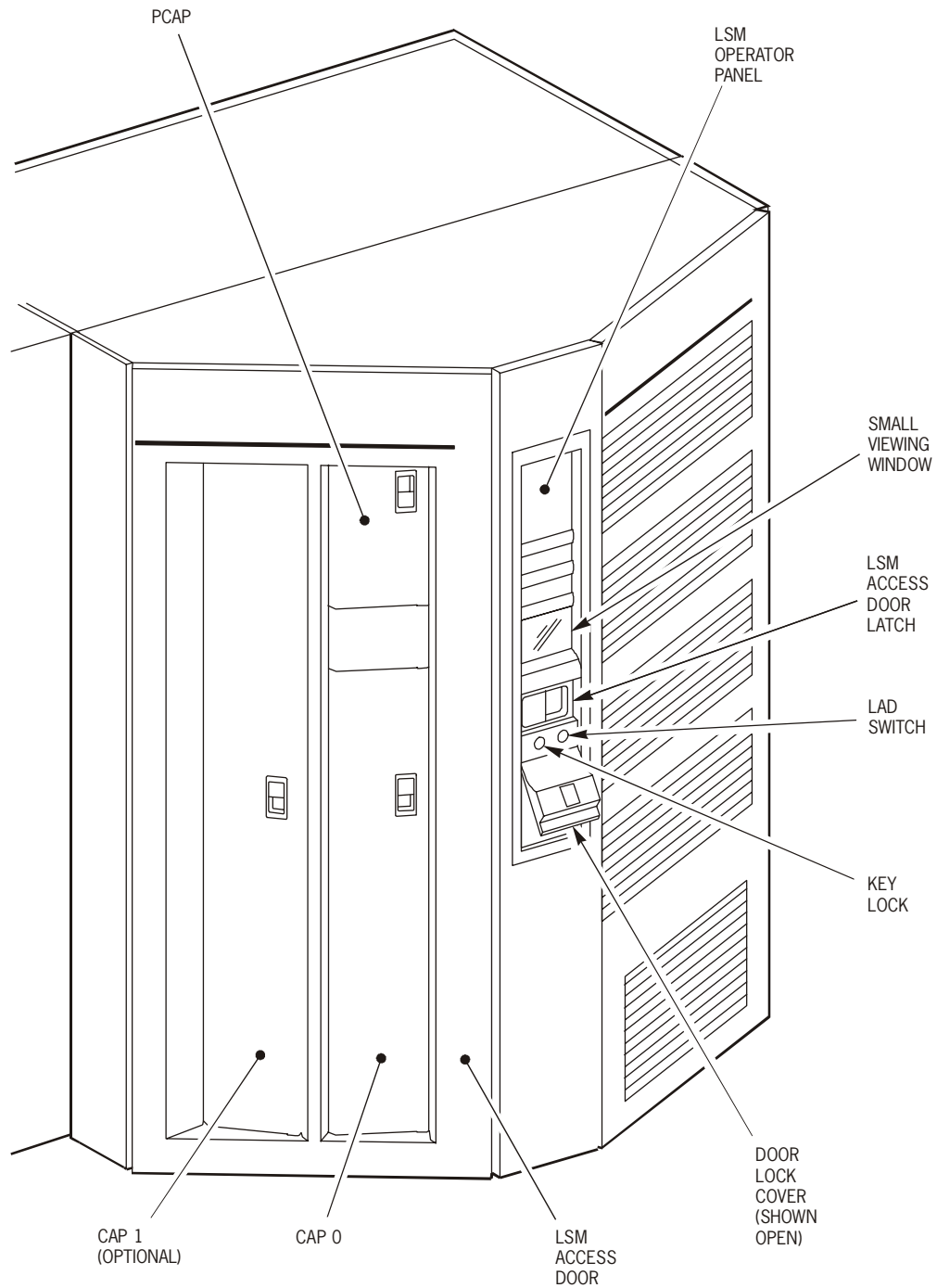
The LSM operator panel displays DO NOT ENTER.

3. Insert the key and unlock the latch.
4. Pull the paddle handle to release the door latches and open the access door.
5. Turn the key to the locked position, remove the key, and shut the LAD.

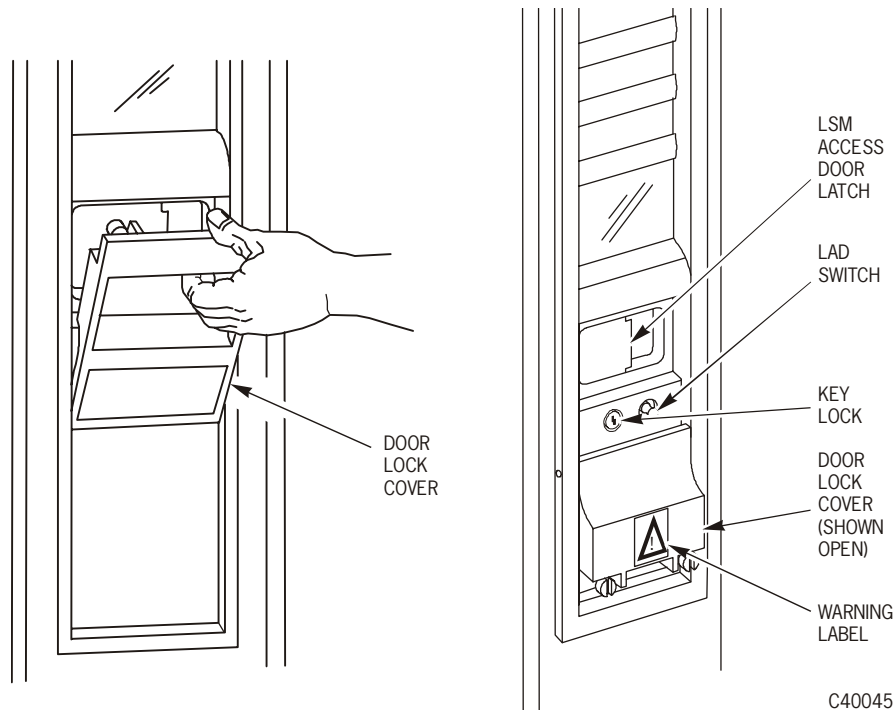
This action locks the access door in the open position.

- The panel displays SAFE TO ENTER.
- The lights turn on inside the LSM.

**Figure 3-11. LSM Access Door, Outside View**



C40044

**Figure 3-12. LSM Access Door Latch and Door Lock Cover**

6. Enter the LSM with the LAD key.

Taking the key inside the LSM prevents another person from closing and locking the access door after you enter.

**After you have opened an LSM door:**

**CAUTION:**  
**COMPONENTS ARE SENSITIVE TO STATIC ELECTRICITY. MAKE SURE YOU TOUCH UNPAINTED METAL BEFORE REACHING INSIDE THE LIBRARY.**

7. Touch an unpainted metal surface with your finger, such as the LSM frame just inside the access door.
8. Keep your body movement to a minimum as you touch the drives or LSM components.

**Note:** Antistatic wrist straps with clip-on ends are commercially available.

## Moving the Robot

When you have opened the LSM access door, you might need to move the robot to make it easier to gain access to the stored cartridges or to the attached cartridge drives.

Read and observe the following caution and warning notices before attempting to move any portion of the robot.

**CAUTION:**  
**ROBOT COMPONENT DAMAGE.**

- **Body oils can corrode shiny polished surfaces or lubricated parts. DO NOT TOUCH POLISHED SURFACES OR LUBRICATED PARTS.**
- **ONLY MOVE HAND AND THETA ASSEMBLY AS SHOWN (SEE [Figure 3-13 on page 3-21](#) THROUGH [Figure 3-15 on page 3-23](#)).**
- **DO NOT FORCE HAND AND THETA ASSEMBLIES.**

**If the hand or theta assemblies do not move freely, contact Customer Support Services.**

- **If the LSM goes offline due to an EPO or power failure, the reach mechanism might be extended into a storage cell or transport. If the robot is moved vertically or horizontally when this condition exists, the hand assembly will be seriously damaged. MAKE SURE THE REACH MECHANISM IS FULLY RETRACTED TO HOME POSITION BEFORE MOVING ANY ROBOT PART.**

**WARNING:**  
**BODILY INJURY.**

- **KEEP HANDS OFF EXPOSED ELECTRICAL PARTS WHEN MOVING ANY PART OF ROBOT.**
- **DO NOT MOVE HAND ASSEMBLY BY GRASPING THE COUNTER-WEIGHT ASSEMBLY. The moving components have pinch-points that can injure fingers or hands.**
- **DO NOT PLACE HAND/FINGERS ON COUNTERWEIGHT ASSEMBLY TRACKS WHEN MOVING ASSEMBLY. A severe pinch-point exists between the counterweight assembly and the tracks it moves on that can injure fingers or hands.**

## Raising and Lowering the Hand Assembly

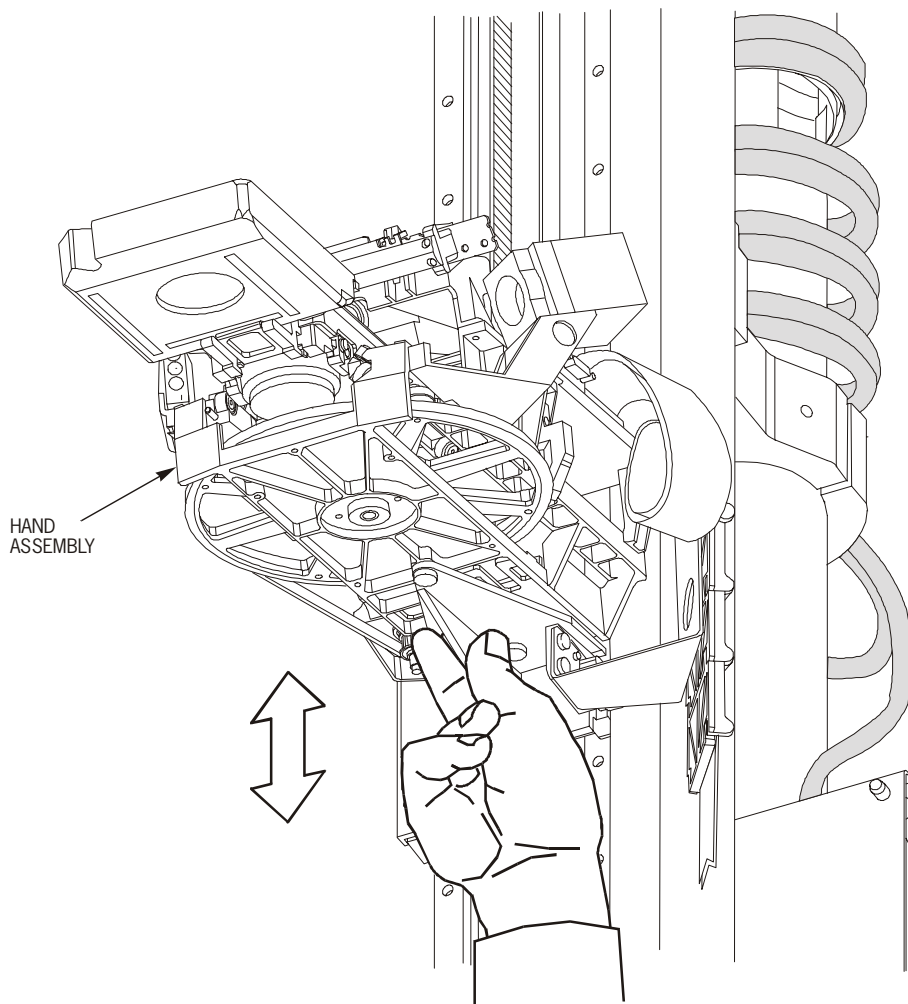
**CAUTION:**

**LSM PREVENTED FROM INITIALIZING.** If you push the hand up too fast, the carriage belt slackens and can catch on the counterweight, which will prevent the LSM from initializing. **MOVE THE HAND ASSEMBLY SLOWLY AND CAREFULLY.**

If you need to move the hand assembly vertically, *slowly and carefully* pull down or push up by grasping the brace beneath the hand, as shown in [Figure 3-13](#).

**Note:** If the LSM does not initialize, notify Customer Support Services.

**Figure 3-13. Moving the Hand Assembly Vertically**



C40046

## Rotating the Theta Assembly

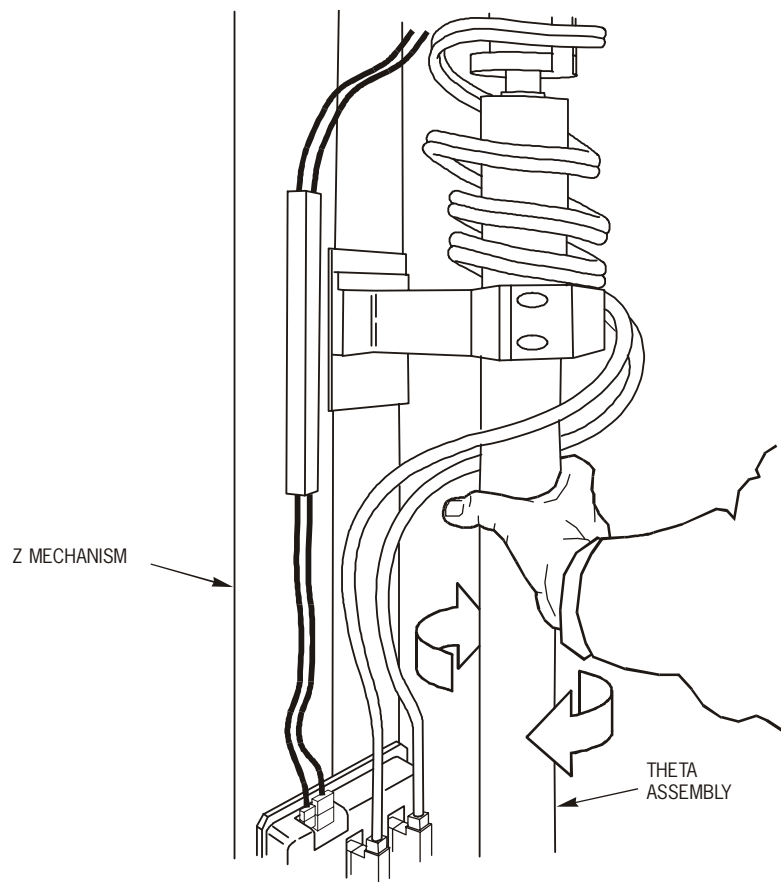
**CAUTION:**  
**EQUIPMENT DAMAGE.** Theta assembly does not move a full 360 degrees. **DO NOT FORCE THETA ASSEMBLY IF YOU MEET RESISTANCE WHILE TURNING IT.**

If you need to rotate the theta assembly, grasp it and *carefully* turn the assembly, as shown in [Figure 3-14](#).

**Note:** If the assembly meets resistance and stops before the desired position is reached, it has contacted a stopping mechanism ([Figure 3-15 on page 3-23](#)).

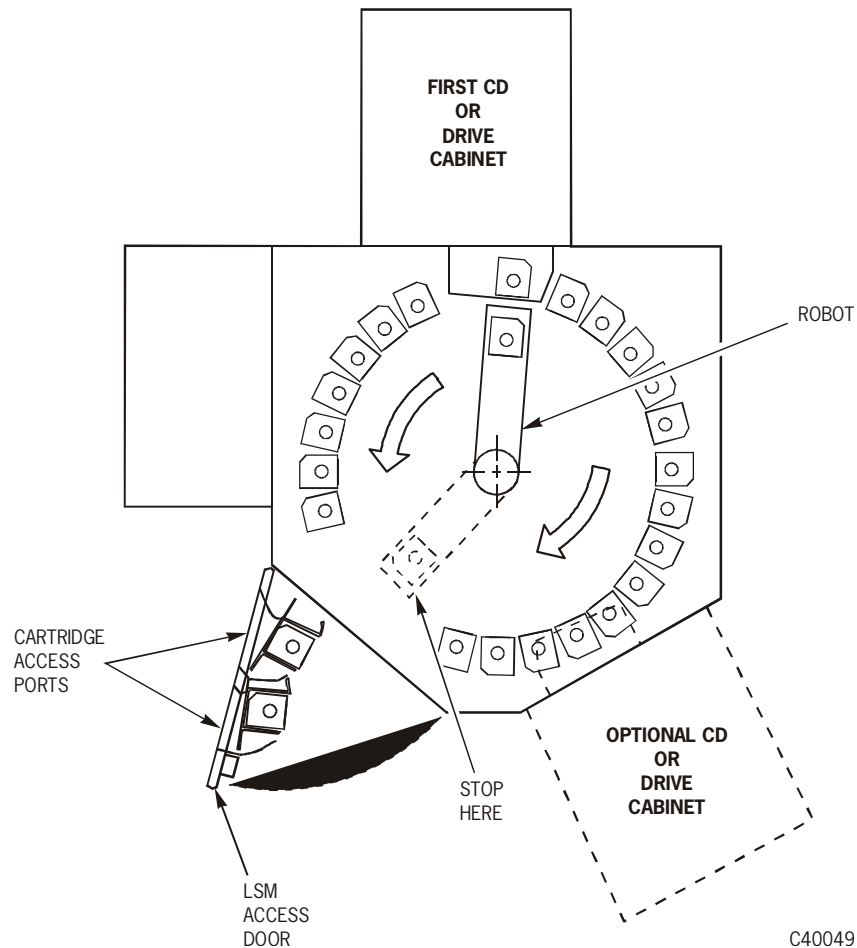
Rotate the shaft in the opposite direction.

**Figure 3-14. Rotating the Theta Assembly**



E40047



**Figure 3-15. Limits for Rotating the Theta Assembly**

## Locating a Cartridge in the Storage Cells

Figure 3-16 on page 3-24 through Figure 3-18 on page 3-26 show the locations of the panels, rows, and columns of the cartridge storage cells in the 9360 LSM. Refer to these figures to locate a cartridge in the LSM. The figures also show the locations of reserved storage cells used for diagnostic and cleaning cartridges.

**Note:** The figures show the types of panels and storage cell locations in some typical configurations. Additional panel types, with variations in the placement of the storage cells, are not shown.

### CAUTION:

**LSM PREVENTED FROM GOING ONLINE.** The LSM will not be able to complete its initialization routines and can not be placed online if cartridges are present in reserved cells. **DO NOT PLACE CARTRIDGES IN RESERVED CELLS.**

**Figure 3-16. Cartridge Locations, Top View**

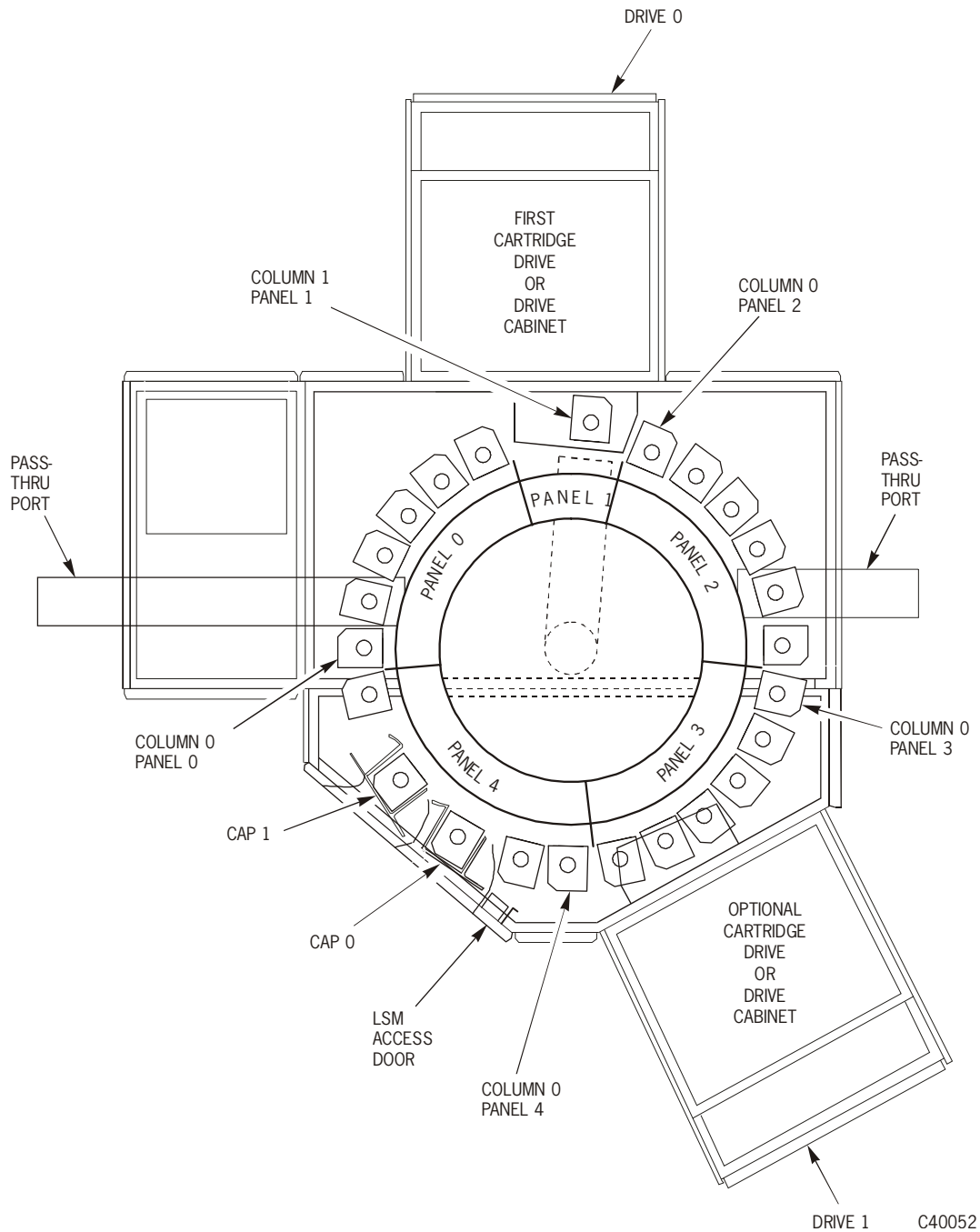
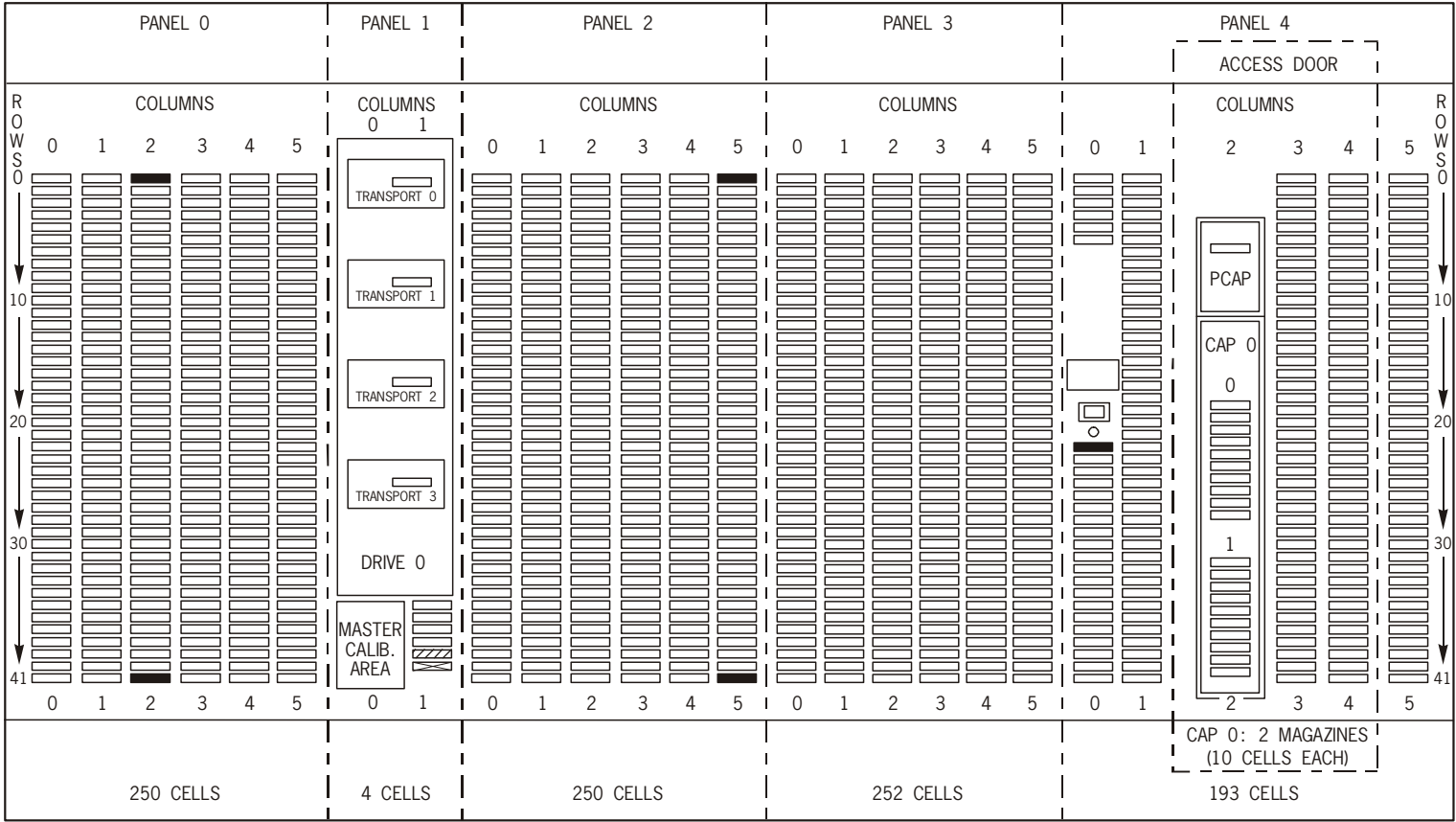


Figure 3-17. Cartridge Locations With Cartridge Drives

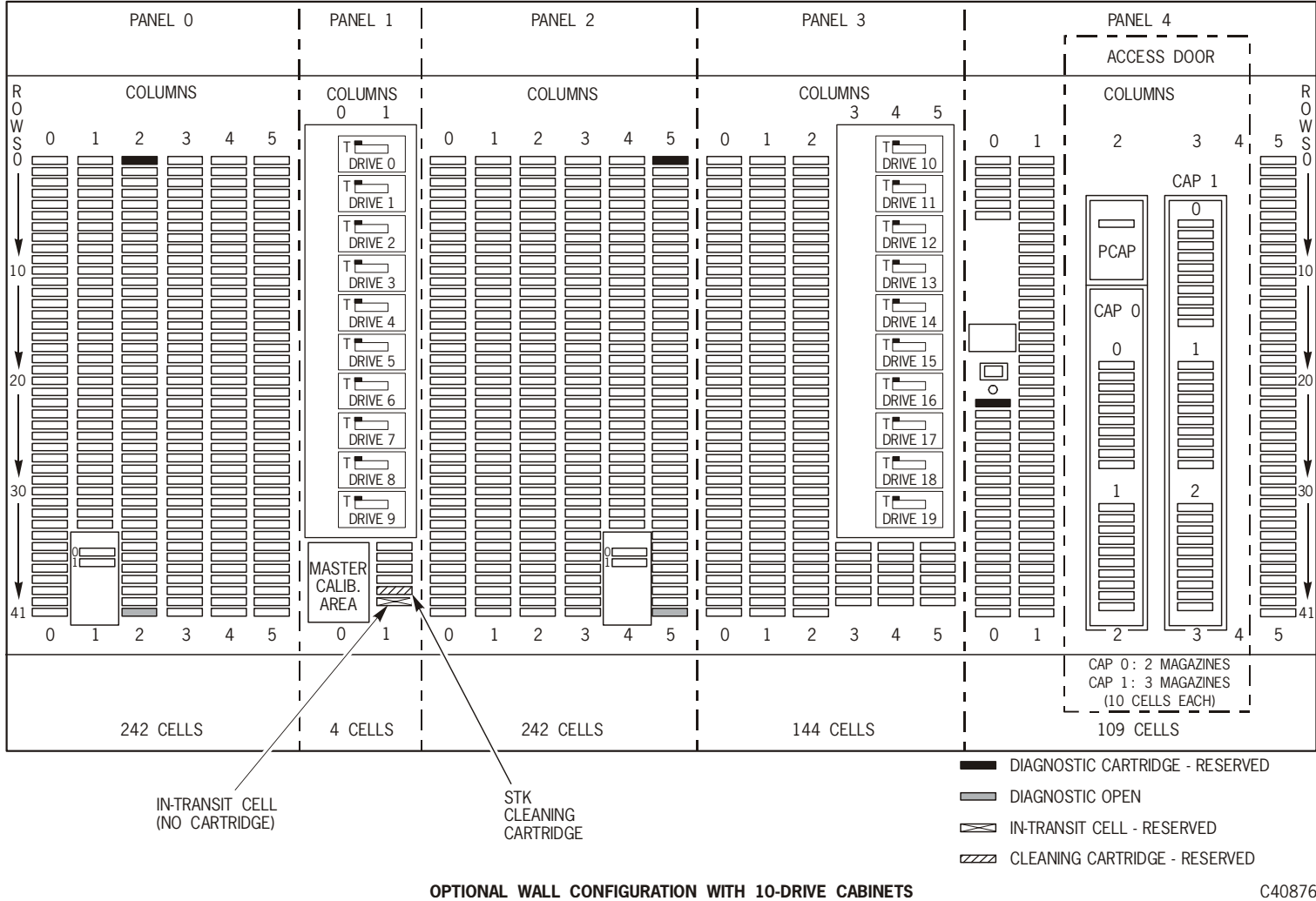


- DIAGNOSTIC CARTRIDGE - RESERVED
- ▨ IN-TRANSIT CELL - RESERVED
- ▧ CLEANING CARTRIDGE - RESERVED

STANDARD WALL CONFIGURATION

C40053

Figure 3-18. Cartridge Locations with 10-Drive Cabinets



C40876

## Removing a Cartridge from the Hand Assembly

If the LSM goes offline due to a power failure, or the **EPO** switch has been pushed when the robot is moving a cartridge, the cartridge might be left in the hand assembly. You can remove it from the hand and manually mount it into a drive/transport for a read/write operation or into the CAP.

Refer to your software user's guide for a complete description of operating the LSM when it is offline.

Before starting this operation, you must take precautions against ESD.

**Note:** Even a small electrostatic discharge could damage an electrical component inside the library. A damaged component might not fail immediately, but over time, it will become worse, possibly causing an intermittent problem.

Refer to [Figure 3-19 on page 3-28](#) and [Figure 3-20 on page 3-28](#). To remove a cartridge from the hand assembly:

**Note:** Do not enter the LSM until you are familiar with the procedure described in [“Entering the LSM” on page 3-17](#).

### CAUTION:

**ROBOT DAMAGE. FOLLOW PROCEDURES IN “Moving the Robot” on page 3-20 TO PREVENT DAMAGE.**

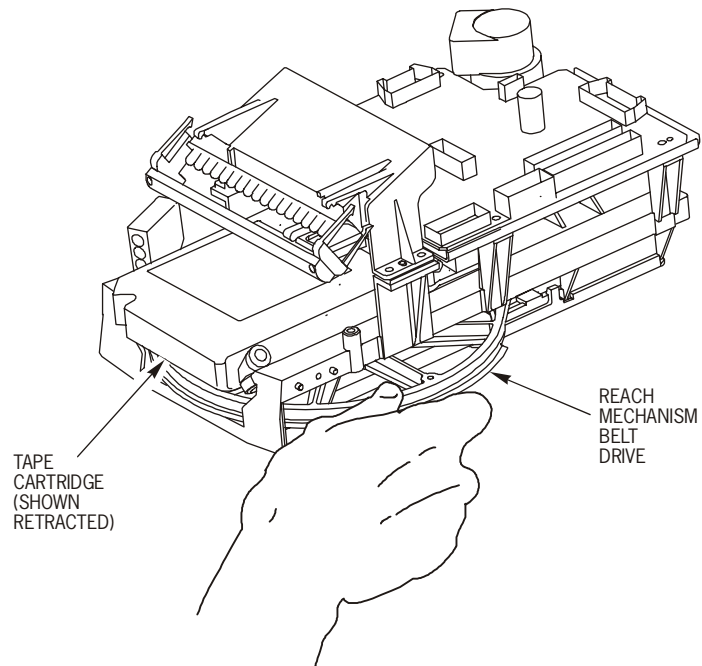
1. Rotate the theta assembly until the hand assembly is facing the LSM access door.
2. Refer to [Figure 3-19 on page 3-28](#) and rotate the pulley for the reach mechanism until the gripper mechanism is extended to its full position, as shown in [Figure 3-20 on page 3-28](#).
3. Hold the reach mechanism pulley with one hand and grasp the cartridge with the other.
4. Pull gently on the cartridge until it is released from the gripper mechanism, as shown in [Figure 3-20 on page 3-28](#).

### CAUTION:

**EQUIPMENT DAMAGE. If the gripper mechanism is left extended and the robot is turned manually, the gripper will strike a storage cell. If it is left extended and the hand assembly is facing the LSM access door when it is closed, the door will strike the gripper mechanism. MAKE SURE GRIPPER MECHANISM IS IN HOME POSITION.**

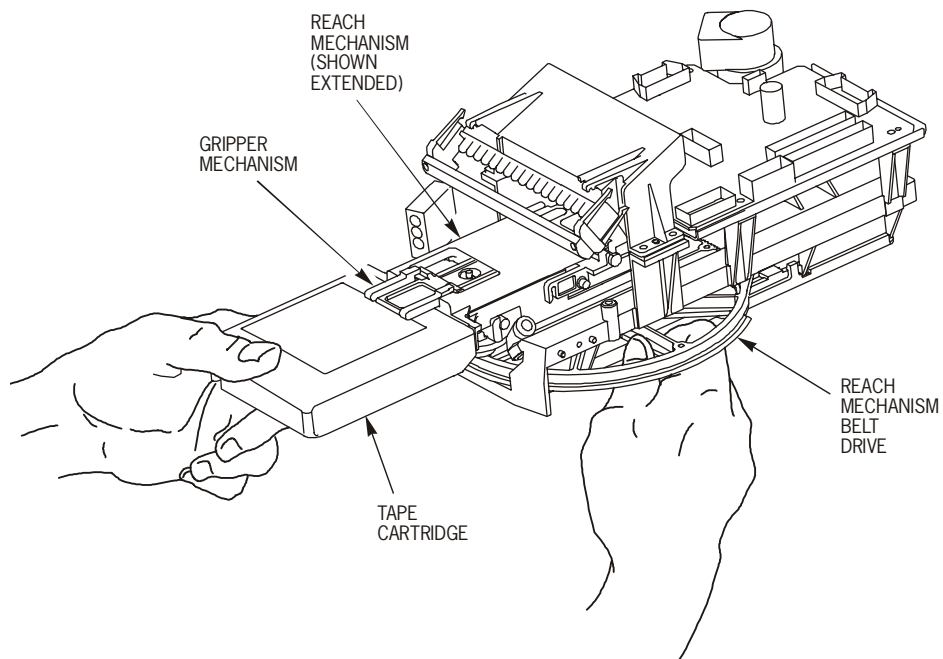
5. Turn the belt drive for the reach mechanism until the gripper mechanism is back in its home position.

**Figure 3-19. Extending the Gripper Assembly**



C40061

**Figure 3-20. Removing a Cartridge from the Hand Assembly**



C40256

## Performing Manual Mounts—Host Software Component

The following pages describe how to perform manual mounts in an LSM that is offline. These procedures apply *only* to an ACS that is running under the host software component (HSC) version of the Nearline software.

If your ACS is running under a non-host software component version, contact your systems administrator for manual mount information.

### Resetting the Transport Display

**Note:** Only the 4480/4490 drives require resetting of the transport display.

At the beginning of manual mode operation, each 4480/4490 transport is in a HOLD OFF LOAD condition. In this condition, the message display panel above the transport is blank and the transport does not load if a cartridge is mounted. *This condition must be cleared before you mount cartridges manually.*

Figure 3-21 on page 3-30 shows the locations of the 4480/4490 switches and message display panel. To reactivate the transport display and clear the HOLD OFF LOAD condition:

**Note:** Do not enter the LSM until you are familiar with the procedure described in “Entering the LSM” on page 3-17.

1. If the transport contains an unloaded cartridge, remove it from the transport and the LSM.

Do not place it in an empty storage cell in the LSM. It must be entered through the CAP for the LSM to properly catalog it.

2. With the transport empty and the **READY** indicator on, hold down the **REWIND** and **UNLOAD** switches simultaneously for about 4 seconds.

**WARNING:**

**BODILY INJURY. Empty transports perform elevator motions if the control unit is powered off and then powered on. KEEP FINGERS AWAY FROM TRANSPORT OPENINGS UNTIL TRANSPORT DISPLAY IS ACTIVATED.**

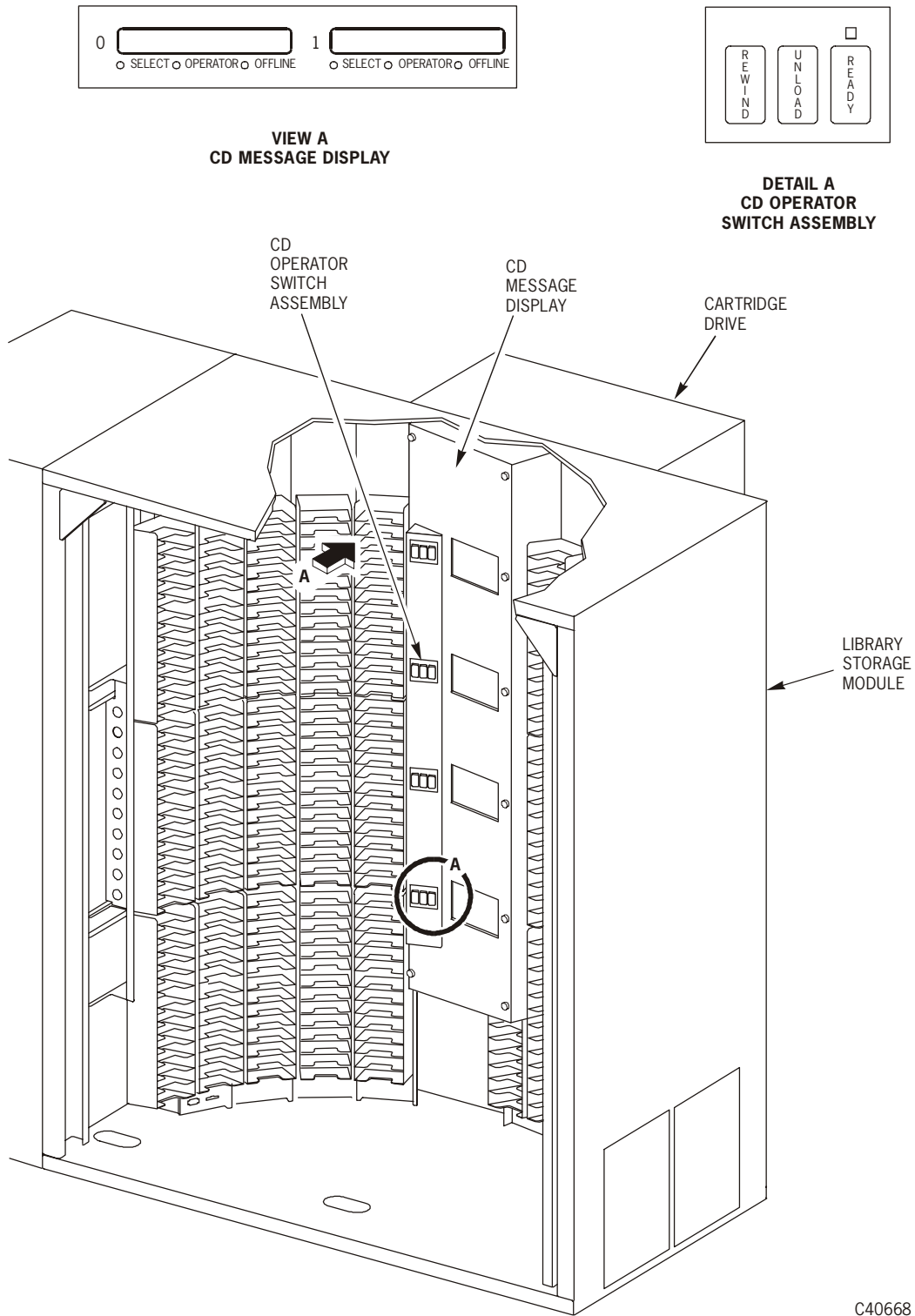
3. If the **READY** indicator is off:

- Press the **READY** switch.
- Hold down the **REWIND** and **UNLOAD** switches at the same time.

The transport display must be activated and the HOLD OFF LOAD condition cleared for each nonbusy transport that does not have an active display.

**Note:** Allocated transports display the cartridge volume serial number and the cell location. An asterisk is displayed if the transport is not allocated to a mount request.

**Figure 3-21. Cartridge Drive, Inside View**





When an unallocated transport is properly reset, this display appears:

								*	
--	--	--	--	--	--	--	--	---	--

Setting Transport Display Intensity

**Note:** Only the 4480/4490 drives allow setting of the transport display intensity.

To adjust the intensity of the transport display:

- 1. Press the **REWIND** and **UNLOAD** switches at the same time.

**Note:** When the switches are held down, the display dims to the next level of intensity (100 percent, 50 percent, 25 percent, and off) every 2 seconds.

- 2. Release the switches when a suitable intensity is present.

Locating a Cartridge in the LSM

The following pages describe how to locate a cartridge in the LSM. The cartridge VOLSER and cell location are provided in a console message and on the transport/drive display panel.

Cartridge Location in the Console Message

The console message provides the VOLSER and cell location of the cartridge, and the address of the transport/drive allocated for the mount. Before entering the LSM, write down the VOLSER, cell location, and transport/drive address.

Cartridge Location on the Message Display Panel

Inside a manual mode LSM, the transport/drive display panel—when the transport is allocated by the operating system for a mount—toggles between the VOLSER and cell location of the requested cartridge. The VOLSER appears as seven characters: the six-character volume serial number prefixed with an M, indicating the transport is waiting for the mount.

The cell location appears in the following format:

	<i>l</i>	<i>l</i>	<i>p</i>	<i>p</i>	<i>r</i>	<i>r</i>	<i>c</i>	<i>c</i>	
--	----------	----------	----------	----------	----------	----------	----------	----------	--

where:

- ll** identifies an LSM
- pp** identifies an LSM panel
- rr** identifies a row in the panel
- cc** identifies a column in the row

An example of the location displayed is:

	0	1	0	2	1	1	0	4	
--	---	---	---	---	---	---	---	---	--

In the example, the cartridge is in LSM 01, Panel 02, Row 11, Column 4.

## Manually Mounting a Cartridge

Before starting any of these operations, you must take precautions against ESD.

**Note:** Even a small electrostatic discharge could damage an electrical component inside the library. A damaged component might not fail immediately, but over time, it will become worse, possibly causing an intermittent problem.

When the operating system sends a mount request for a volume residing in a manual mode LSM, the transport/drive display shows the location of the cartridge.

**Note:** Do not enter the LSM until you are familiar with the procedure described in [“Entering the LSM” on page 3-17](#).

### To mount the cartridge into a transport:

1. Activate the transport display. See [“Resetting the Transport Display” on page 3-29](#) for instructions.
2. Locate the cartridge and remove it from the cell location.
3. Inspect the cartridge for damage. See [“Inspecting a Cartridge” in Appendix A, “Cartridge Tape Information.”](#)

### WARNING:

**BODILY INJURY. The transport elevator lowers automatically. KEEP FINGERS OUT OF TRANSPORT WHEN MOUNTING A CARTRIDGE.**

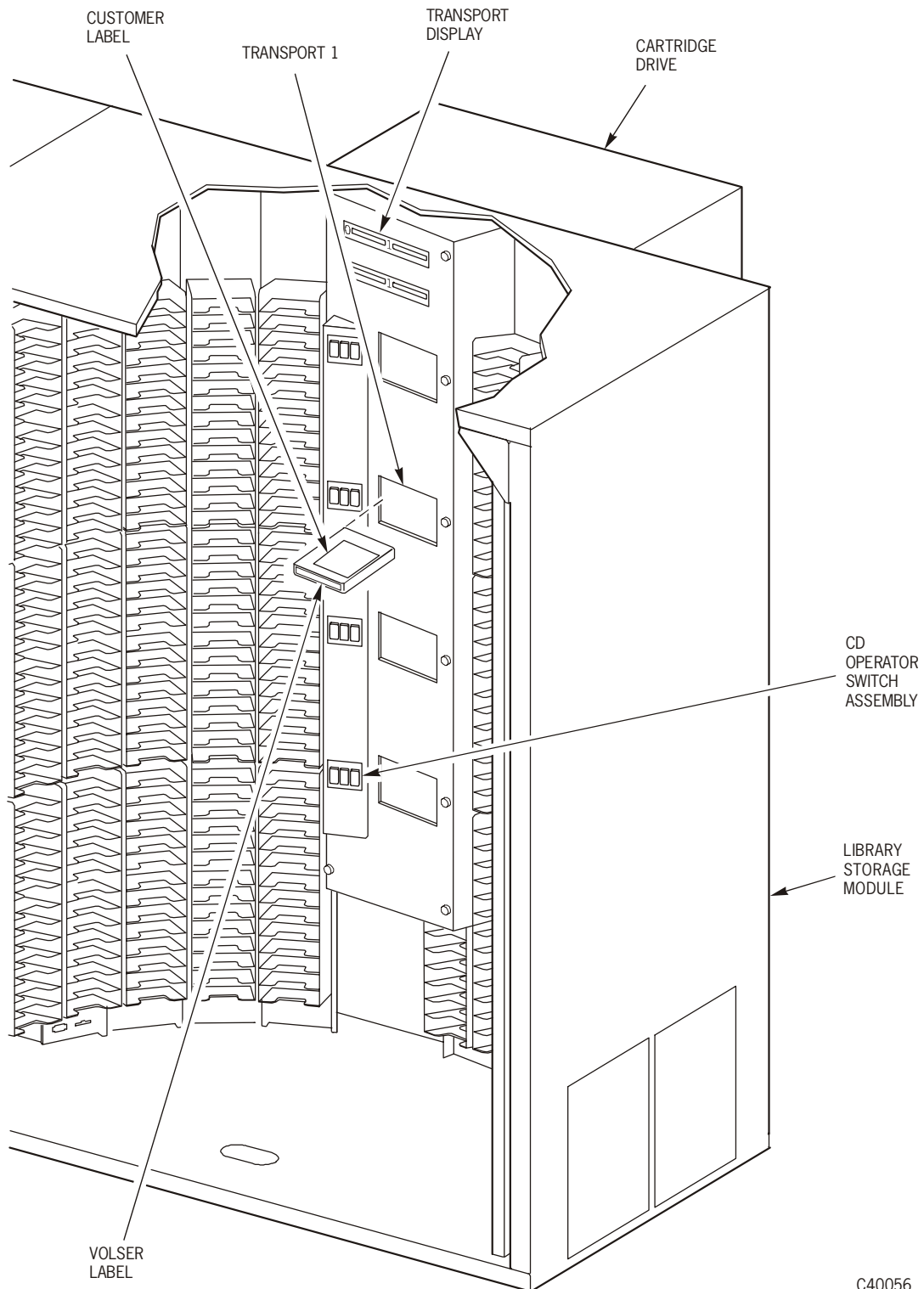
4. Make sure that the transport *READY* LED is lit.

**Note:** The 9840 and T9940 drives do not have this LED.

5. Insert the cartridge into the transport with the customer label on top and the VOLSER toward you as shown in [Figure 3-22 on page 3-33](#).

**Note:** If the 4xxx transport does not load the cartridge, verify the elevator is down, and press the **REWIND** switch to activate the transport.

6. Observe the drive display. It should show either Ready F (cartridge is write protected) or Ready U (cartridge is unprotected).

**Figure 3-22. Inserting a Cartridge into the Transport**

## Manually Dismounting a Cartridge

Before starting any of these operations, you must take precautions against ESD.

**Note:** Even a small electrostatic discharge could damage an electrical component inside the library. A damaged component might not fail immediately, but over time, it will become worse, possibly causing an intermittent problem.

### ***4xxx, 9490, and SD-3 Transports***

1. Be sure the transport is not in use by the system.
2. Enter the LSM.
 

**Note:** Do not enter the LSM until you are familiar with the procedure described in [“Entering the LSM” on page 3-17](#).
3. Go to the desired transport.
4. Press the READY switch, to place the transport in the Not Ready position.
5. Press the UNLOAD switch. (The transport rewinds and unloads the cartridge.)
6. Remove the cartridge from the raised elevator.
7. Press the READY switch, to place the transport in the Ready position.

**Note:** The Ready LED comes on when this action is performed. The transport is ready for automated operations.

8. Exit the LSM and store the cartridge *outside* the LSM.

### ***9840/T9940 Drives***

1. Be sure the transport is not in use by the system.
2. Enter the LSM.
 

**Note:** Do not enter the LSM until you are familiar with the procedure described in [“Entering the LSM” on page 3-17](#).
3. Go to the desired transport.
4. Press the UNLOAD switch. One of the following conditions will occur:

**Note:** If the UNLOAD switch is pressed during a write operation, the drive tries to write the remaining data before the cartridge tape unloads. If the operator panel displays the “UnWr xxxx” (Unwritten Data) message (where xxx = the fault symptom code), the attempt failed and some data remains unwritten on the tape. Consult the *T9940 Tape Drive Operator’s Guide*, PN 95989 or the *9840Tape Drive User’s Reference Manual*, PN 95739, for this situation.

- a. After the tape rewinds, the cartridge tape ejects from the drive. Remove the cartridge from the drive.
  - b. The cartridge tape fails to eject after the tape rewinds. Refer to the *9840 Tape Drive User's Reference Manual*, PN 95739, or the *T9940 Tape Drive Operator's Guide*, PN 95989 for this situation.
5. Exit the LSM and store the cartridge *outside* the LSM.

## Returning the LSM to Online Status

The following procedures must be performed to place the LSM online and ready to perform automated operations.

- Making the transports ready
- Securing the LSM
- Placing the LSM online
- Entering cartridges that you removed

### Making the Transports Ready

All the transports must be in a READY condition before the LSM access door is closed and the LSM placed in automated mode.

Check the **READY** indicator above the **READY** switch on the operator panel for every transport.

- If this indicator is lit, do nothing to the corresponding transport.
- If this indicator is not lit, press the **READY** switch until the indicator turns on.

### Securing the LSM

To secure the LSM and make it ready for automated operations:

1. Move the theta assembly back off of the stops to a neutral position.  
[Figure 3-15 on page 3-23](#) shows the location of the stops.

This ensures that the robot performs its initialization movements correctly.

2. Close the LSM access door.
  - a. Open the LAD, insert the key in the lock, and turn the key to the unlocked position.
  - b. Pull the latch handle and *gently* close the door, pushing on both top and bottom until it clicks shut.
  - c. Turn the key to the locked position.
  - d. Remove the key from the lock and close the LAD.

When the LSM is powered on, initialization occurs.

## **Placing the LSM Online**

Refer to your software user's guide and enter the command at the operator console to place the LSM online to perform automated operations.

## **Entering Cartridges that You Removed**

After placing the LSM online, enter the cartridges through the CAP, as described in [“Entering Cartridges through the CAP” on page 3-10](#).

Refer to your software user's guide for more information about this procedure.

# Obtaining Support

## 4

This chapter describes what to do if problems occur with the Library Storage Module (LSM).

In some cases, you might be able to correct the problem.

- When the problem is caused by cartridge tapes, refer to [Appendix A, “Cartridge Tape Information.”](#)
- When the problem is caused by cartridge subsystems or tape drives, refer to the documentation for that product.

In other cases, you must contact your service representative or the Call Center.

- Most of the time, a fault symptom code (FSC) will appear on the LSM operator panel display. Write down the information on the display and give it to either your service representative or the staff at the Call Center.

## ■ Customer Support Services

The Call Center for Customer Support Services (CSS) is available 24 hours a day, seven days a week, to customers with StorageTek maintenance contracts and to StorageTek employees. You can find additional information about the CSS at the Product and CRC Support link on StorageTek’s external web site at:

<http://www.support.storagetek.com>.

## ■ Customer Initiated Maintenance

Customer Initiated Maintenance begins with a telephone call from you to the StorageTek CSS. You receive immediate attention from qualified StorageTek personnel, who record problem information and respond with the appropriate level of support.

To contact the CSS about a problem:

1. Use the telephone to call the StorageTek Customer Support Services at:

**☎ 1-800-735-2778** (from within the United States)

**☎ 303-673-4056** (from outside the United States)

2. Describe the problem to the call taker. The call taker will ask several questions and will either route your call to or dispatch a service representative.

If you have the following information when placing a service call, the process will be much easier:

Account name	<hr/>
Site location number	<hr/>
Contact name	<hr/>
Telephone number	<hr/>
Equipment model number	<hr/>
Device address	<hr/>
Device serial number (if known)	<hr/>
Urgency of problem	<hr/>
Fault Symptom Code (FSC)	<hr/>
Problem description	<hr/>

## ■ StorageTek's Worldwide Offices

You may contact any of StorageTek's worldwide offices to discuss complete storage, service, and support solutions for your organization. You can find address and telephone number information in the Worldwide Locations drop down window on StorageTek's external web site at:

<http://www.storagetek.com>



# Cartridge Tape Information

# A

This appendix describes how to prepare and maintain cartridges. It also lists the criteria that colored cartridges must meet to be used in the Library Storage Module (LSM).

## ■ Preparing Cartridges

The following pages describe how to prepare a cartridge for use in the LSM.

### Handling a Cartridge

Improper handling of cartridges can result in a loss of data or damage to a machine component.

To handle a cartridge correctly:

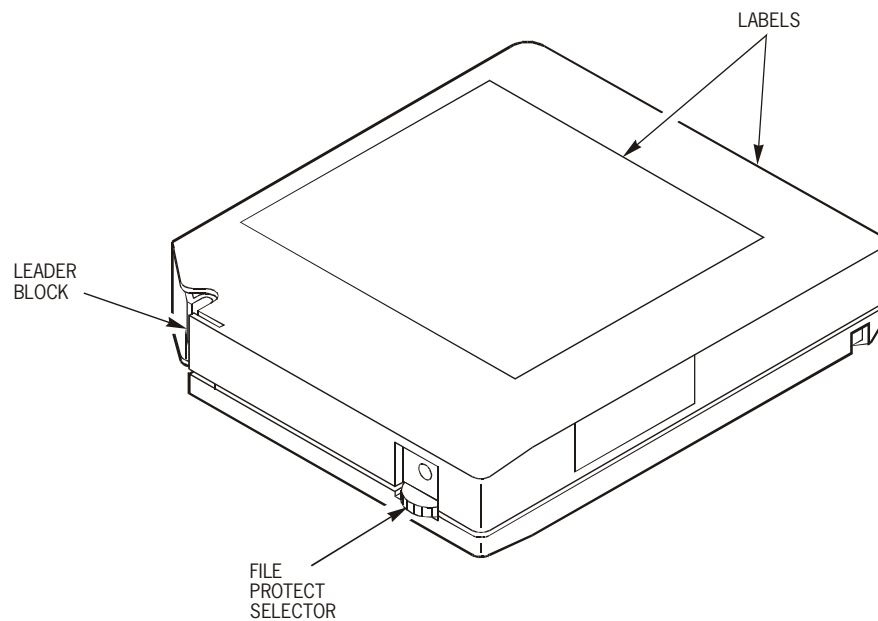
- Do not carry several cartridges loosely in a container. The leader blocks can snag on other cartridges and become unlatched.
- Make sure that the leader block is latched every time you pick up a cartridge.
- Keep cartridges *clean*.
- Inspect a cartridge before each use and *never* put a damaged cartridge into a transport or LSM.
- Never release a leader block and pull tape from a cartridge.
- Never open a cartridge.
- Do not handle tape that is outside the cartridge; you might damage the tape edge.
- Do not expose the tape or cartridge to direct sunlight or moisture.
- Do not expose a recorded cartridge to magnetic fields; this might destroy data on the tape.

## Inspecting a Cartridge

A defective or dirty cartridge can damage a tape drive or transport. Always inspect a cartridge before inserting it into a tape drive, inserting it into a tape transport, or entering it into an LSM. See [Figure A-1](#) through [Figure A-6](#) on [page A-5](#). Look for:

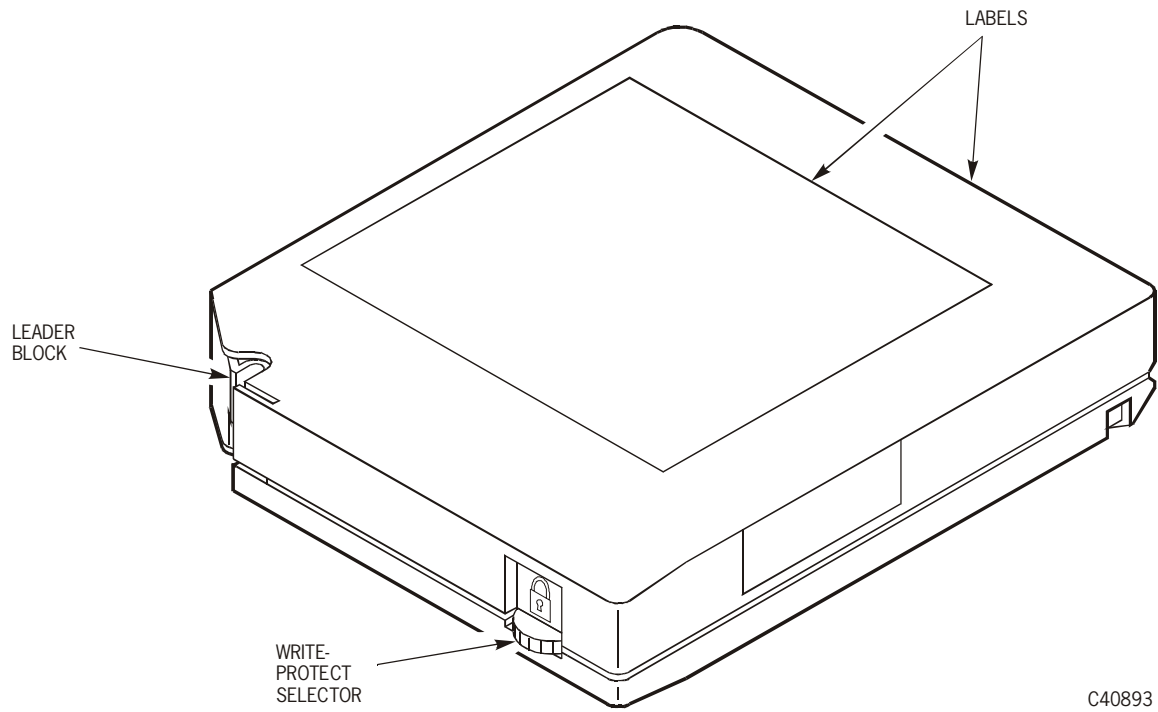
- Cracked or broken cartridge
- Broken leader block
- Broken leader block latch
- Damaged file protect selector
- Liquid in the cartridge
- Labels not firmly attached or extending over the cartridge edge
- Any other obvious damage

**Figure A-1. 3480 Cartridge Locations**

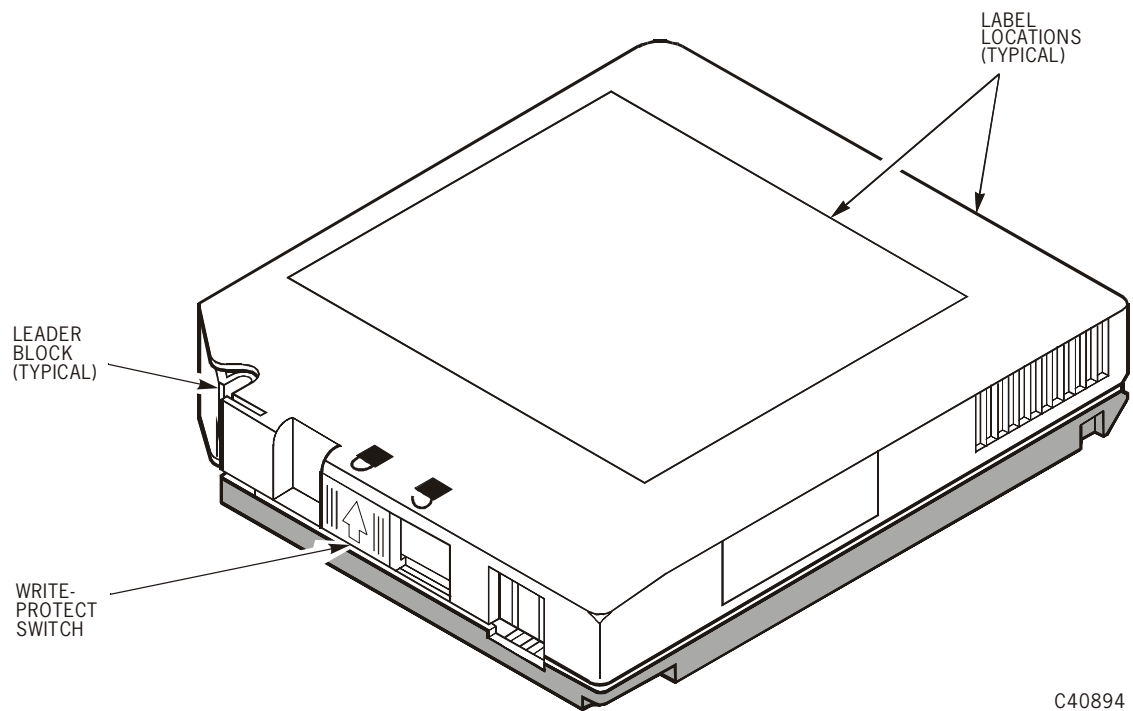


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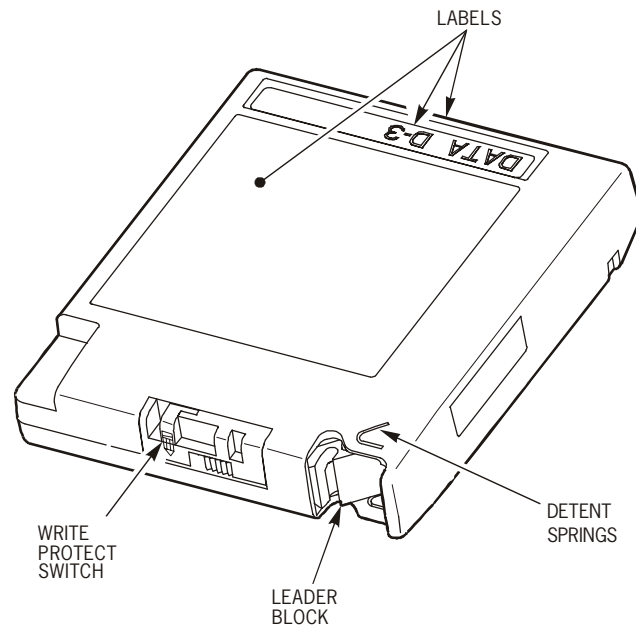
**Figure A-2. ETape Cartridge Locations**



**Figure A-3. EETape Cartridge Locations**

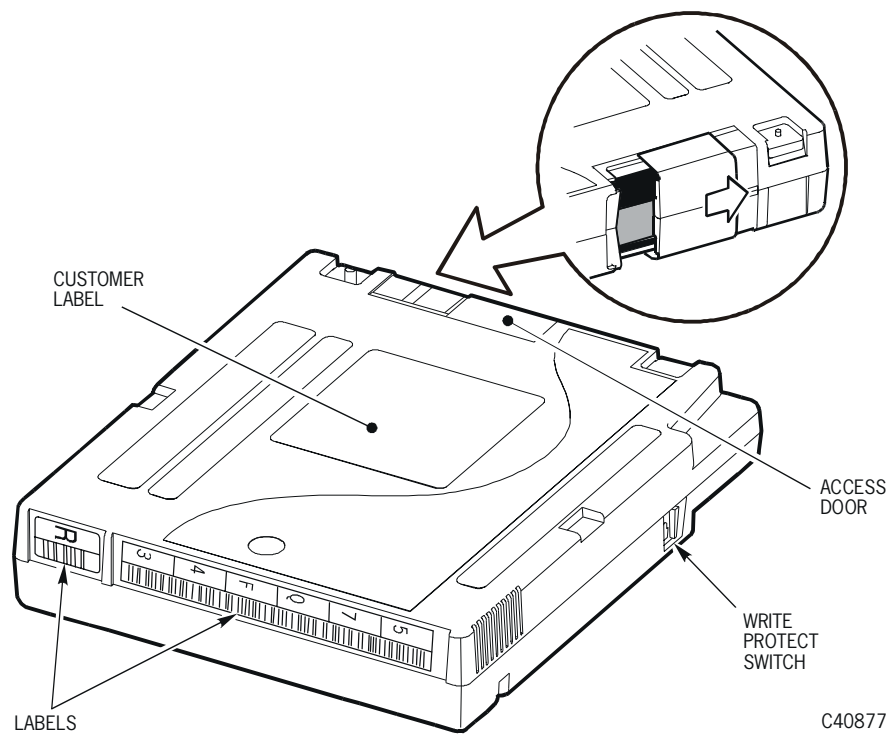


**Figure A-4. SD-3 Cartridge Locations**

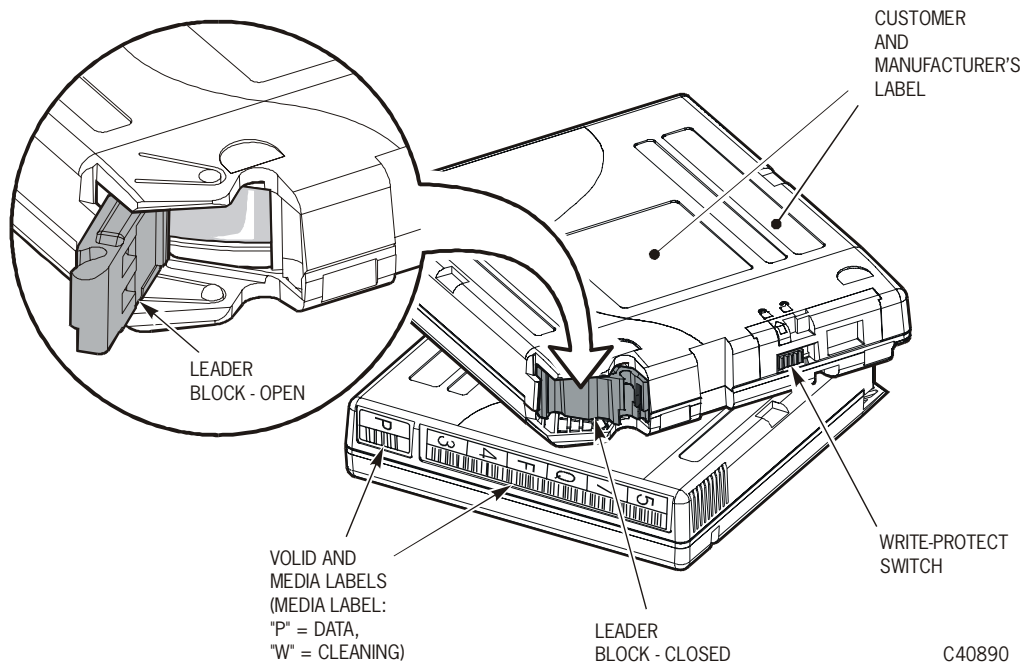


C40868

**Figure A-5. 9840 Cartridge Locations**



C40877

**Figure A-6. T9940 Cartridge Locations**

## Applying Cartridge Labels

Cartridge labels reflect the cartridge media and usage. Cleaning cartridges have CLN in the VOLSER, while diagnostic cartridges have DG in the VOLSER. The media ID label correlates to the tape drive or transport capable of using the cartridge:

- Nonlabeled cartridges can be used for recording in the 4480, 4490 or 9490.
- A, B, and C labels are used for recording in the SD-3.
- D labeled cartridges are used in the SD-3 for cleaning.
- E labeled cartridges can be used for recording in the 4490 and 9490.
- P labeled cartridges are used for recording in the 9840.
- R labeled cartridges are used for recording in the T9940.
- U labeled cartridges are used in the 9840 for cleaning.
- W labeled cartridges are used in the T9940 for cleaning.
- Z labeled cartridges can be used for recording in the 9490.

The two kinds of cartridge labels are:

- Customer label
- Volume serial number (VOLSER) label

**Note:** The VOLSER label has optical character recognition (OCR) and both bar code components.

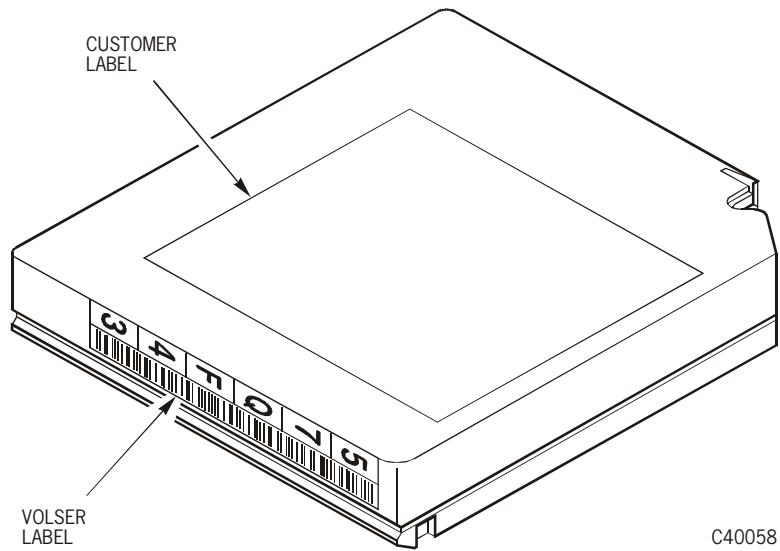
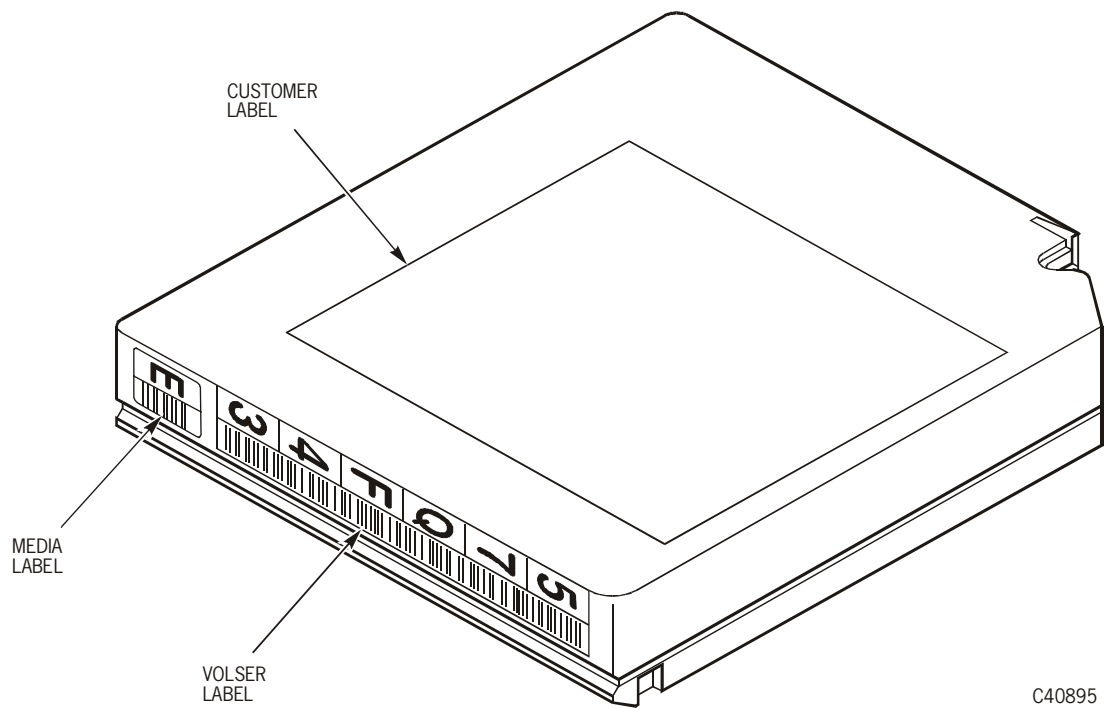
Place the labels on the recessed areas provided on each cartridge:

1. Make sure that the cartridge has been at room temperature for at least 24 hours.
2. Clean the surface where the labels will be placed using a cleaning solution made for this purpose. See [“Cleaning the Cartridge Exterior” on page A-15](#).
3. Peel the backing from the labels.
4. Position the labels as shown in [Figure A-7 on page A-7](#) through [Figure A-12 on page A-9](#).
5. Center the labels with the adhesive side toward the cartridge surface and press into place.

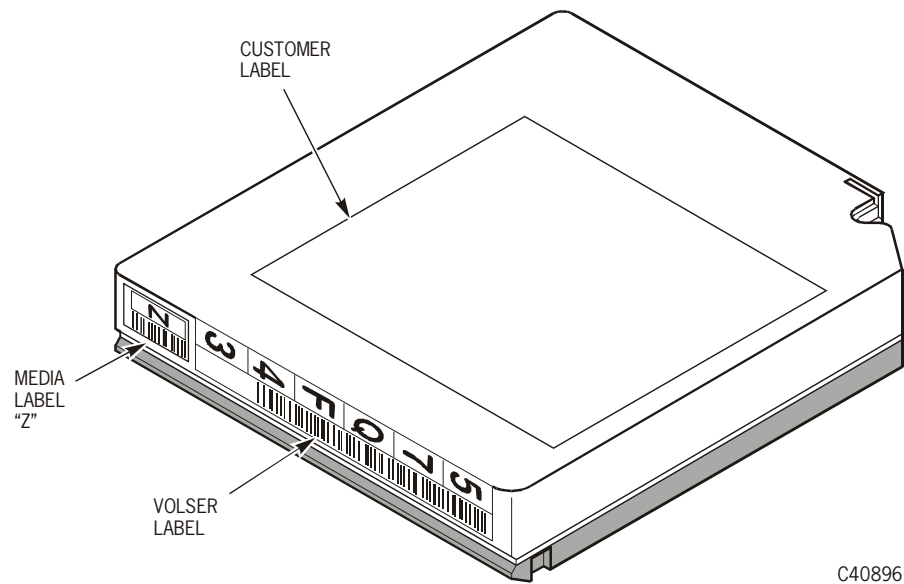
The label must be within the indented area of the cartridge so that the edges of the label are parallel to the edges of the cartridge. The label should be close to the inside edge of the indented area but must *never* overlap the edge of this area.

**Notes:**

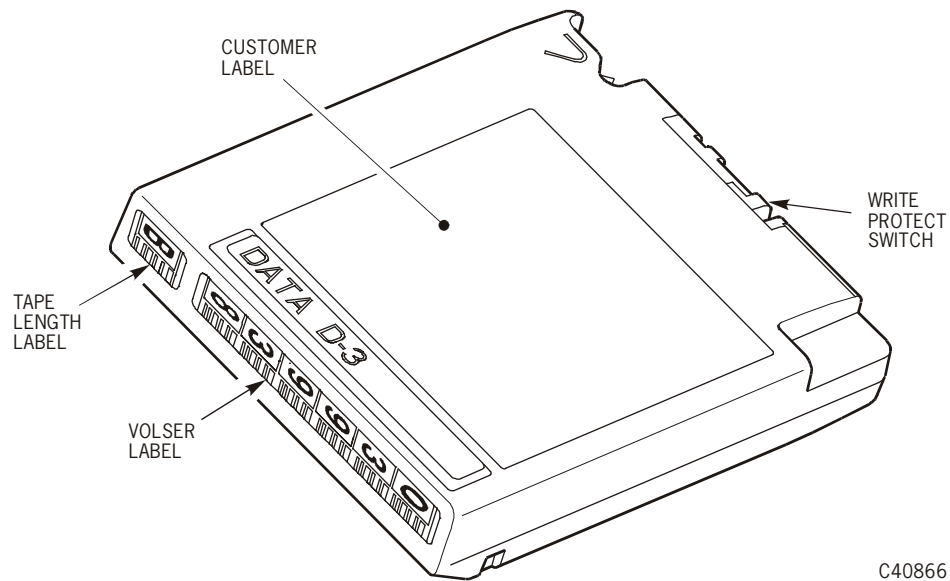
1. Make sure the labels are not placed elsewhere on the cartridge surface.
2. Make sure the edges of the labels do not curl up; curling causes the cartridge to stick in the transport loader.
3. Use labels that do not leave a residue when removed.
4. Make sure the label contains a VOLSER.

**Figure A-7. 3480 Cartridge Label Locations****Figure A-8. ETape Cartridge Label Locations**

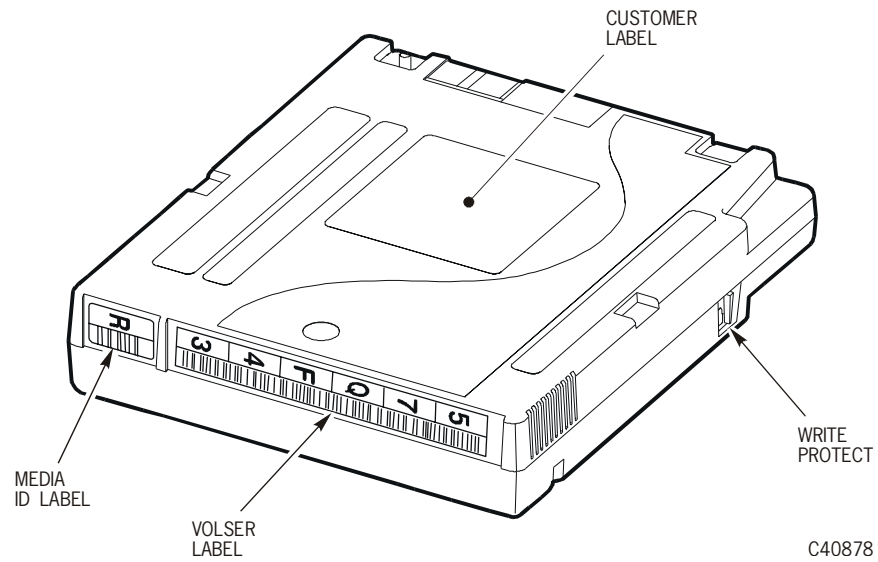
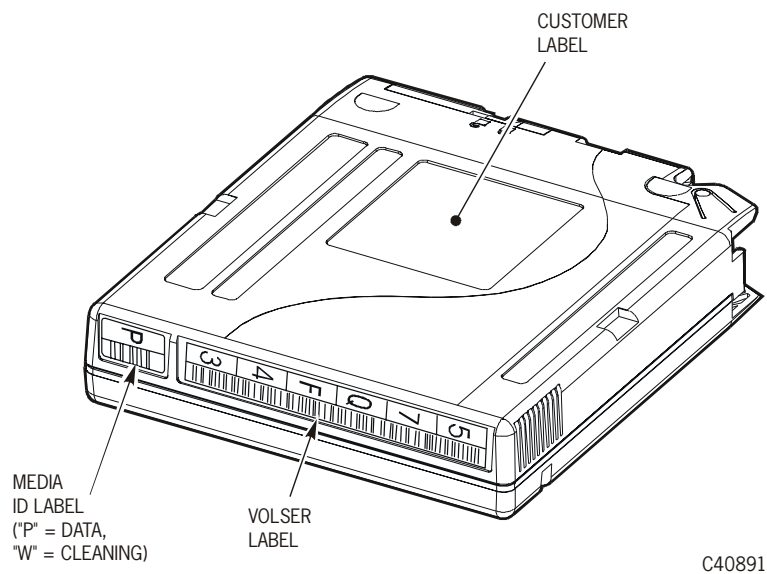
**Figure A-9. EETape Cartridge Label Locations**



**Figure A-10. SD-3 Cartridge Label Locations**





**Figure A-11. 9840 Cartridge Label Locations****Figure A-12. T9940 Cartridge Label Locations**

## Setting the File Protect Selector

The following information applies to file protecting cartridges (3480, ETape, or EETape) used in either 4xxx or 9490 tape transports (drives).

Set the cartridge to read-only (file protected or write protected). The drive can not write data on the tape.

- Turn thumbwheel on the 3480 cartridge until a white dot in a dark background appears on the thumbwheel, as shown in [Figure A-13](#).
- Turn thumbwheel on the ETape cartridge until a locked padlock appears on the thumbwheel, as shown in [Figure A-14 on page A-11](#).
- Align the arrow under the locked padlock ([Figure A-15 on page A-11](#)).

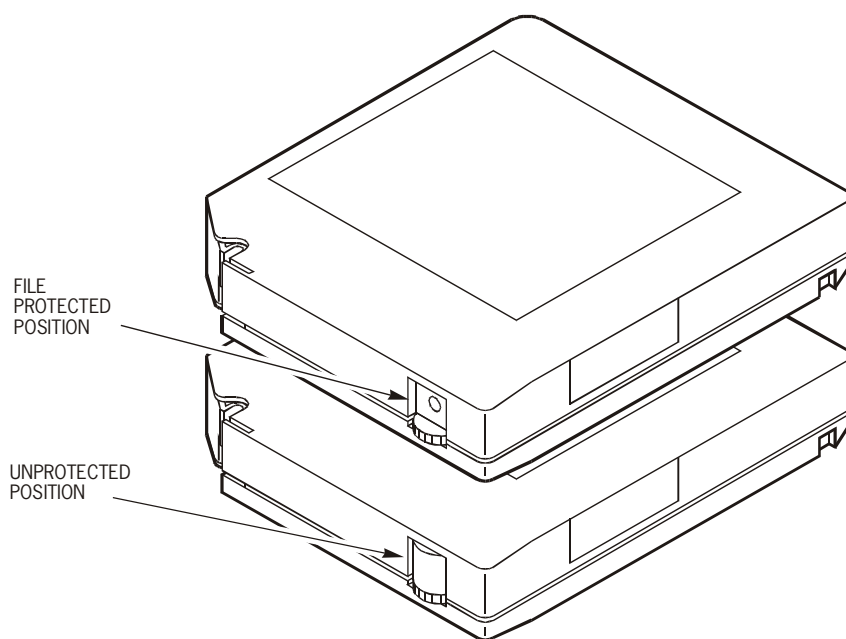
Set the cartridge to write enabled. The drive can write as well as read data.

- Turn thumbwheel on the 3480 cartridge until the white dot above the thumbwheel disappears, as shown in [Figure A-13](#).
- Turn thumbwheel on the ETape cartridge until the padlock above the thumbwheel disappears, as shown in [Figure A-14 on page A-11](#).
- Align the arrow under the open padlock ([Figure A-15 on page A-11](#)).

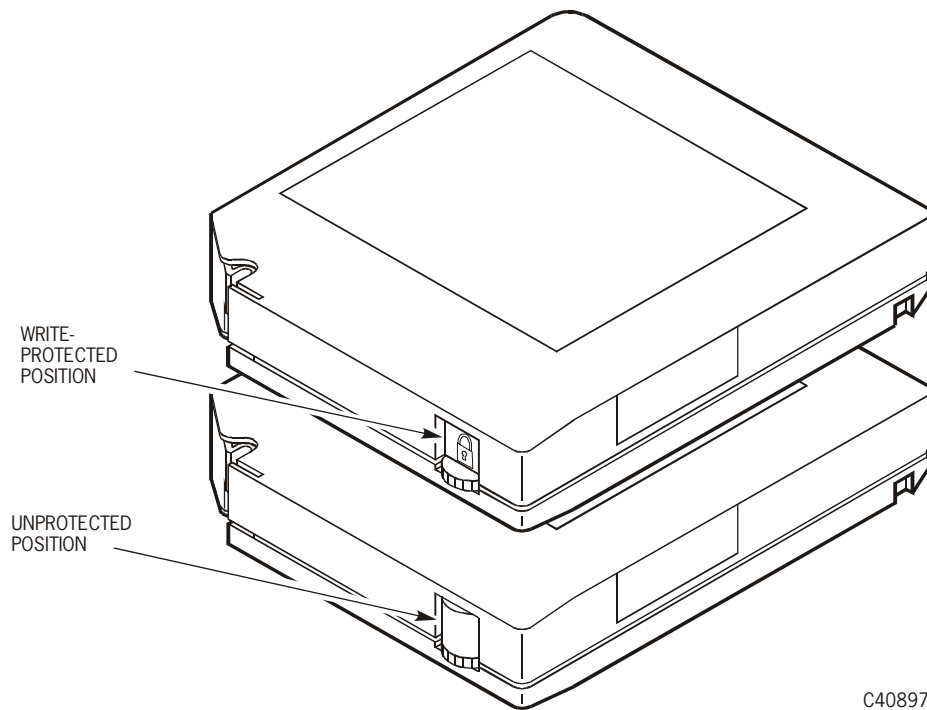
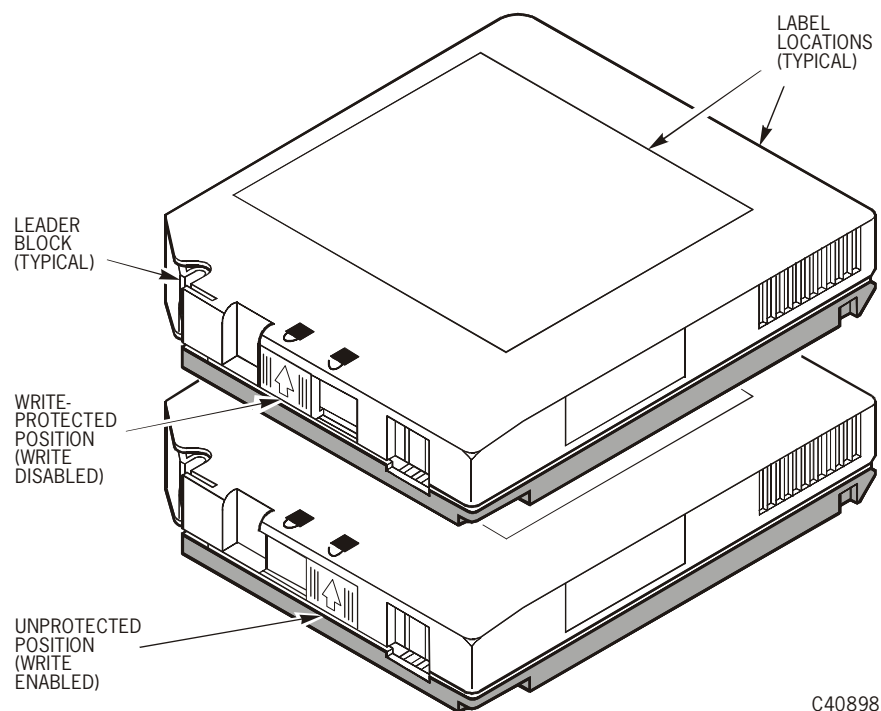
This setting is recommended when entering cartridges into the LSM.

**Note:** Some software has a feature called virtual thumbwheel, allowing read-only access to a cartridge that is not physically write protected.

**Figure A-13. 3480 Cartridge File Protect Selector**



C40059

**Figure A-14. ETape Cartridge Write-Protect Selector****Figure A-15. EETape Cartridge Write-Protect Selector**

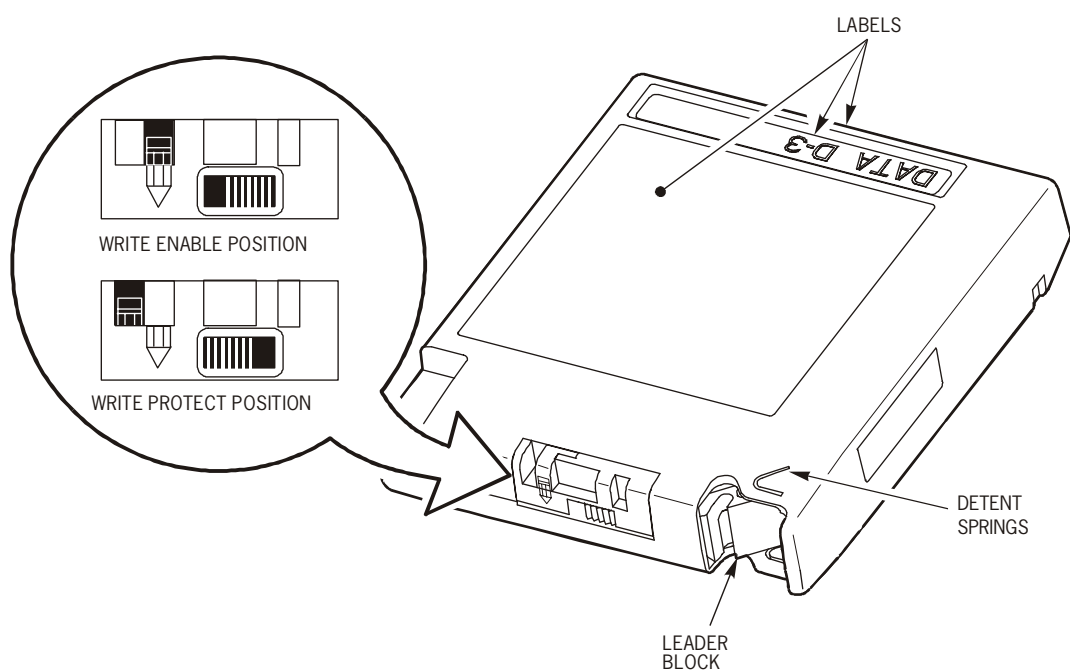
## Setting the SD-3 Write Protect Switch

You can set the write protect switch so that the cartridge is read-only (nothing can be written on the tape). Slide the switch to the right so that the pencil icon is split as shown in [Figure A-16](#). In this position, the drive can only read data from the tape and can not write data.

You can set the write protect switch so that the SD-3 cartridge is write enabled. Slide the switch to the left so that the pencil icon is joined as shown in [Figure A-16](#). In this position, the drive can write as well as read data. This setting is recommended when entering cartridges into the LSM.

**Note:** Some software has a feature called virtual thumbwheel, allowing read-only access to a cartridge that is not physically write protected.

**Figure A-16. SD-3 Cartridge Write Protect Switch**



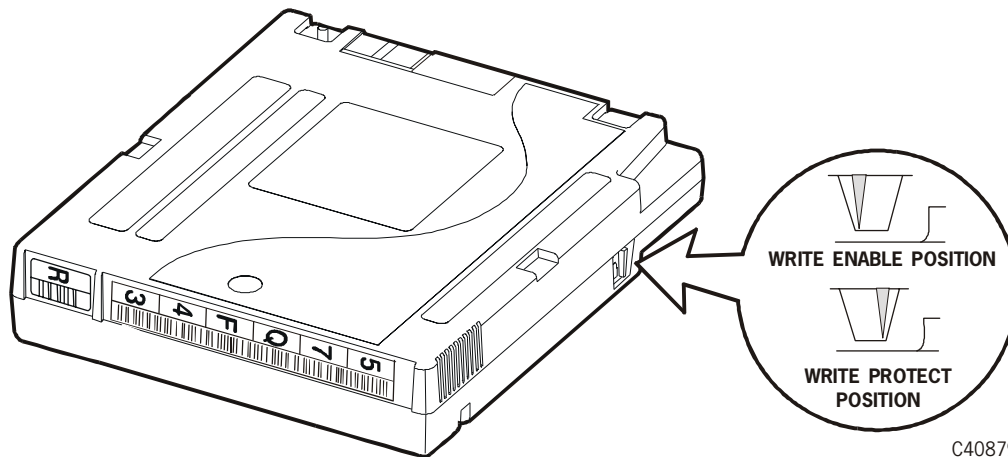
C40867

## Setting the 9840 Write Protect Switch

You can set the write protect switch so that the cartridge is read-only (nothing can be written on the tape). Hold the cartridge with the customer label side up and the VOLSER label toward you as shown in [Figure A-17](#). Move the write protect switch to the front of the cartridge (away from you) to the write protect position. In this position, the drive can only read data from the tape and can not write data.

You can set the write protect switch so that the cartridge is write enabled. Move the write protect switch to the back of the cartridge (toward you) to the write enable position. In this position, the drive can write as well as read data. This setting is recommended when entering cartridges into the LSM.

**Figure A-17. 9840 Cartridge Write Protect Switch**



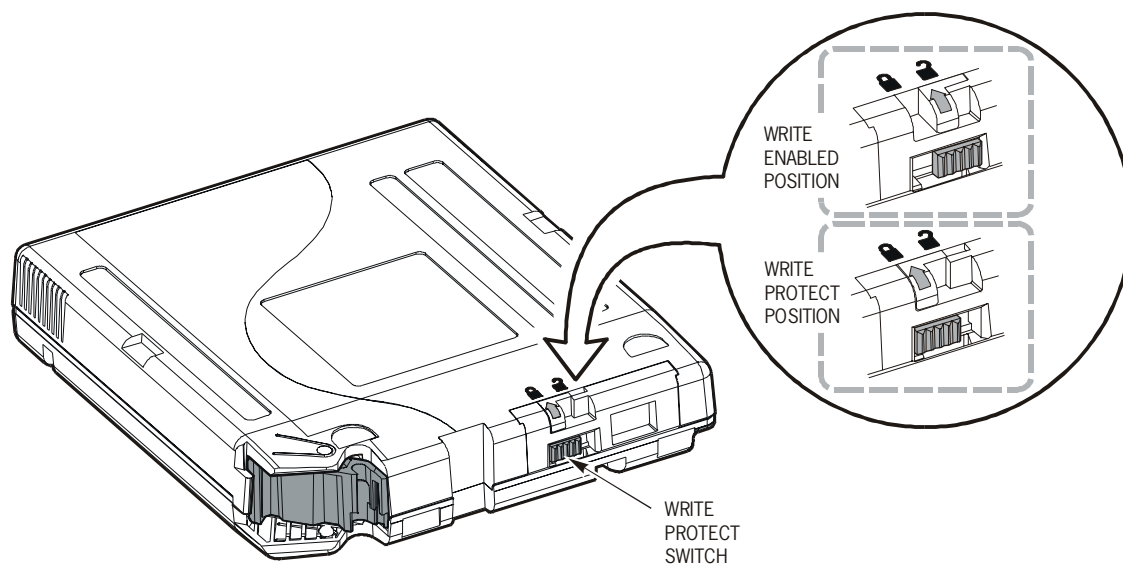
## Setting the T9940 Write Protect Switch

You can set the write protect switch so that the cartridge is read-only (nothing can be written on the tape). Hold the cartridge with the customer label side up and the VOLSER label toward you as shown in [Figure A-18](#). Slide the switch to the write protect position. In this position, the drive can only read data from the tape and can not write data.

You can set the write protect switch so that the cartridge is write enabled. Slide the switch to the write enable position. In this position, the drive can write as well as read data.

**Note:** This setting is recommended when entering cartridges into the LSM.

**Figure A-18. T9940 Cartridge Write Protect Switch**



C40892

## ■ Maintaining Cartridges

The following pages describe how to store and clean cartridges, use cleaning cartridges, and repair a detached leader block.

### Storing Cartridges

When you store a cartridge:

- Keep a cartridge in its protective wrapping until you are ready to use it. Use the tear string, not a sharp instrument, to remove the wrapping.
- Store cartridges in a clean environment duplicating the conditions of the room in which they will be used.
- Before using a cartridge, make sure that it has been in its operating environment for at least 24 hours.

### Cleaning the Cartridge Exterior

**CAUTION:**

**CARTRIDGE DAMAGE.** Certain solvents can damage the cartridge. **DO NOT REMOVE LABELS OR CLEAN CARTRIDGES USING ACETONE, TRICHLOROETHANE, TOLUENE, XYLENE, BENZENE, KETONE, METHYLETHYL KETONE, METHYLENE CHLORIDE, ETHYLDICHLORIDE, ESTERS, ETHYL ACETATE, OR SIMILAR CHEMICALS.**

Wipe all dust, dirt, and moisture from the cartridge with a lint-free cloth.

Use StorageTek Tape Cleaner Wipes, PN 404628901 (or higher) to clean the cartridges. These wipes are saturated with isopropyl alcohol. Do not let any solution touch the tape or get inside the cartridge.

### Using Cleaning Cartridges

Cleaning cartridges have a unique 3-character alphanumeric prefix in their VOLSER (default is “CLN”). Cleaning cartridges can not be used as scratch cartridges or initialized by software utilities.

When a transport requires cleaning, the software tells the hand to remove a cleaning cartridge from its cell and insert it into a transport. [Figure 3-17 on page 3-25](#) shows where the cartridges are stored in the LSM.

**Note:** If the LSM has no cleaning cartridges, you are prompted to enter a cleaning cartridge into the CAP.

**CAUTION:**

**UNPREDICTABLE RESULTS.** When you enter a cleaning cartridge, the software considers it to be new and sets the usage counter to zero. **DO**

**NOT RE-ENTER A CLEANING CARTRIDGE THAT HAS BEEN EJECTED FROM AN LSM.**

## **Repairing a Detached Leader Block**

When a tape is damaged, use a backup tape. If a leader block is detached, the cartridge or tape has no obvious damage, and you have no backup tape, you may repair the leader block using a repair kit provided by your supplier. You can use the tape one time to copy the data onto another tape.

## ■ **Basic Requirements for Cartridges**

The LSM uses cartridges that meet the specifications defined in the ANSI publication, *American National Standard Magnetic Tape and Cartridge for Information Interchange*, ACS X3B5.

Cartridges:

- 102 mm x 127 mm x 25.4 mm (4 in. x 5 in. x 1 in.)
- Integrated thumbwheel

Media:

- Chromium dioxide
- 12.7 mm (0.5 in.) wide
- 165 m (541 ft) long minimum
- No beginning of tape/end of tape reflective markers

VOLSER label:

- Valid characters A-Z, 0-9, # (crosshatch), or trailing blanks
- No leading blanks

## ■ **Cartridge Orders**

To order cartridges, access the following website: <http://www.storagetek.com/products/tape/services/>.



## ■ Specifications for Colored Cartridges

Colored cartridges are approved only if the measured reflection density is greater than 1.2 for SD-3 and 3480 cartridges, and 1.5 for 9840 cartridges, as obtained with an X-Rite 404G color reflection densitometer.

Measurements are:

<b>Bandwidth:</b>	ANSI Status T Wideband (380 to 780 nanometers)
<b>Measuring Range</b>	Density (0.00-2.50) D
<b>Accuracy</b>	$\pm 0.2$ D
<b>Repeatability</b>	$\pm 0.1$ D
<b>Aperture Diameter</b>	3.4 mm

For more information about colored cartridges, contact your StorageTek Marketing representative.

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# Glossary

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This glossary defines abbreviations and new or special terms used in this publication.

Many of the definitions are taken from other sources. The letters in the parentheses that follow some definitions indicate the source of the definition:

(A). *The American National Standard Dictionary for Information Systems, ANSI X3.172-1990*, copyright 1990 by the American National Standards Institute (ANSI).

(E). The ANSI/Electronic Industries Association (EIA) Standard-440-A, *Fiber Optic Terminology*.

(I). *The Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and International Electrotechnical Commission (ISO/IEC/JTC1/SC1).

(IBM). *The IBM Dictionary of Computing*, copyright 1994 by IBM.

(T). Draft international standards committee drafts, and working papers being developed by the ISO/IEC/JTC1/SC1.

## Numerics

**20-drive frame** Also known as a 9741, a frame/wall that contains up to 20 9840 tape drives.

**9741** A 20-drive wall that contains up to 20 9840 tape drives

**9840** A cartridge drive that reads/writes to tapes; the housing for the tape contains supply and take-up reels.

## A

**ACS** See automated cartridge system.

**ACSLs** See Automated Cartridge System Library Software.

**auto clean** A feature of an automated library that allows a cleaning cartridge to automatically clean a tape drive when the drive requires cleaning. The auto clean function must also be supported by the host software.

**automated cartridge system (ACS)** A system that consists of five components: host software, a library management unit, a library control unit, library storage modules, and cartridge subsystems. These components provide automatic mounting and dismounting of cartridge tapes into a transport, cartridge access port, or pass-thru port.

**Automated Cartridge System Library Software (ACSLs)** The software within a UNIX-based server that interfaces the server and hosts; it also maintains a list of all tapes within a library storage module.

**automated mode** A relationship between a library and the client. In automated mode, the robot moves the cartridges among the storage cells, CAP, and drives in response to client commands. This is the normal operating mode of a library that is communicating with the client.

## B

**bar code label** A barcoded external label that is both human- and machine-readable. The format of this label is unique and must be supplied by a StorageTek-approved vendor.

**beginning-of-tape.** A point on the tape where written data begins.

**BOT** See beginning-of-tape.

## C

**CAP** See cartridge access port.

**cartridge.** A storage device that consists of magnetic tape on supply and takeup reels, in a protective housing. (IBM)

**cartridge, 3480** The plastic housing around the tape. It is approximately 100 mm (4 in.) by 125 mm (5 in.) by 25 mm (1 in.). A plastic leader block is attached to the tape for automatic threading when loaded in a transport. The spine of the cartridge contains a label listing the VOLSER (tape volume serial number).

**cartridge, 9840** The plastic housing around the tape. It is approximately 109 mm (4.3 in.) by 125 mm (5 in.) by 25 mm (1 in.). The housing contains the tape and two reels for automatic threading when loaded in a transport. The spine of the cartridge contains a label listing the VOLSER (tape volume serial number).

**cartridge access port (CAP)** An assembly allowing an operator to enter/eject cartridges during automated operations. The CAP is on the access door of an LSM. The standard CAP contains 20 cells. The optional CAP holds 30 cells.

**cartridge drive (CD)** A device containing two or four cartridge transports with associated power and pneumatic supplies.

**cartridge magazine** A removable module for cartridge tapes that is placed in the library by the operator as needed for specific jobs.

**cartridge transport** An electromechanical device that threads tape from a cartridge, moves the tape across a read/write head, writes data onto or reads data from the tape, and returns the tape to its cartridge. A transport is distinct from the power and pneumatic sources that supply the electricity and air it needs to function. *See also* cartridge drive.

**CD** See cartridge drive.

**cell.** A place in which a cartridge resides in a library.

**cleaning cartridge.** A cartridge tape containing special material used to clean the tape path in a transport.

**control unit (CU)** A microprocessor-based unit situated logically between a host channel (or channels) and from two to eight transports. It translates channel commands into transport commands, sends transport status to the channel(s), and passes data between the channel(s) and transport(s).

**controller** A device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole. (IBM)

**controller transport unit (CTU)** An electromechanical device within a cartridge drive that contains control logic and an associated electromechanical device for threading tape from a cartridge, moving the tape across a read/write head, and writing data onto or reading data from the magnetic tape. A cartridge drive contains one, two, three, or four transports. *Synonymous with* tape drive.

**CU** See control unit.

## D

**data tape.** A tape cartridge formatted for use as a regular data tape for the system in which it is used.

**diagnostic tape** An empty cartridge tape (no data or code) with a "DG" label, which is used for diagnostic routines.

**dismount** To remove a cartridge from a tape drive.

**drive.** A device for moving magnetic tape and controlling its movement. (IBM)

## E

**electronics module** Unit attached to the 9360 library storage module. The 9315 EM contains one LCU and one LMU. The 9312 EM contains only the LCU.

**EM** See electronics module.

**emergency power off (EPO)** Pressing the EPO switch on the LSM operator panel or the EPO button on the access door inside the LSM immediately removes all power from the LSM and the LCU.

**end-of-tape (EOT)** The location on a tape where written data ends.

**EPO** See emergency power off.

## F

**fault symptom code (FSC).** A hexadecimal code generated by the drive for controller microcode in response to a detected subsystem error.

**file-protect.** To prevent the destruction or overwriting of data stored on cartridge tape. See also write-protect switch.

**firmware.** An ordered set of instructions and data stored in a way that is functionally independent of main storage; for example, microprograms stored in a ROM. (T)

**FSC.** See Fault Symptom Code.

## H

**hardware.** All or part of the physical components of an information processing system, such as computers or peripheral devices. (T) (A)

**host.** The primary computer on a network, with which other computers interact.

**host interface.** Interface between a network and host computer. (T)

**Host Software Component (HSC)** That portion of the automated cartridge system for a library system that executes on host systems attached to an automated library. This component acts as the interface between the operating system and the rest of the automated library.

## I

**ID** Identifier or identification.

**indicator.** A device that gives a visual or other indication of the existence of a defined state. (T)

**Initial Program Load (IPL).** The initialization procedure that causes an operating system to commence operation.

**input/output (I/O).** Pertaining to a device, process, or channel involved in data input, data output, or both. (IBM)

**interface.** Hardware, software, or both, that links systems, programs, or devices. (IBM)

**interface card.** See input /output.

**intervention required** A message indicating that the operator needs to perform manual action.

**I/O.** See input /output.

**IPL.** See Initial Program Load.

## L

**LAD** See lock access door.

**LAN** See local area network.

**LCD** Liquid crystal display. The type of display used on the operator panel.

**LCU** See library control unit.

**LED** See light emitting diode.

**library control unit (LCU)** Resides in the EM. The LCU receives instructions from the LMU and decodes them into specific move commands. The LCU sends the move commands to the robot where they are executed.

**library management unit (LMU)** The portion of the ACS that manages from 1 to 16 LSMs and communicates with the host CPU.

**library storage module (LSM)** The portion of the ACS that provides the storage area for cartridges plus the robot that moves the cartridges.

**light emitting diode (LED)** An electronic device used mainly as an indicator on status panels to show equipment on/off conditions.

**LMU** See library management unit.

**local area network (LAN)** A computer network over which devices within the network access each other for data transmission purposes. The LMU and attached LCUs are connected by a local area network.

**lock access door** A door mounted on the access door for safety reasons. The procedure to open and close the LAD prevents anyone from being in the LSM when the robot is moving.

**LSM** See library storage module.

## M

**magnetic tape.** A tape with a magnetizable layer on which data can be stored. (T)

**manual mode** A library operating in manual mode does not communicate with the client/host and requires human assistance to perform cartridge operations. Manual mode occurs when the robot is unavailable to the client/host.

**microcode** A code, representing the instruction of an instruction set, that is implemented in a part of storage that is not program-addressable. (IBM) *See also* firmware.

**modem** Modulator/demodulator. An electronic device that converts computer digital data to analog data for transmission over a telecommunications line (telephone line). At the receiving end, the modem performs the inverse function.

**mount** To place a cartridge tape in a drive or transport and make it accessible to the host system.

## N

**Nearline** An ACS component that acts as the interface between the operating system and the rest of the automated library.

## O

**offline.** Neither controlled by, nor communicating with, a computer. (IBM)

**online.** Pertaining to the operation of a functional unit when under the direct control of the computer. (T)

**operating system.** Software that controls program execution.

**operator control panel.** A functional unit that contains switches used to control all or part of a computer and possibly the indicators giving information about its functioning. (T)

**optical character recognition (OCR)** Character recognition that uses optical means to identify graphic characters. (I) (A)

**optical character recognition (OCR) label** An external label attached to a cartridge that is both human- and machine-readable.

## P

**pass-thru port (PTP)** A mechanism that allows one or two cartridges to be passed from one LSM to another when multiple LSMs are connected.

**PCAP** See priority cartridge access port.

**port** In the Library Server version of the Nearline software, the connection between the client operating system and the ACS.

**priority cartridge access port (PCAP)** An assembly allowing an operator to enter or eject one cartridge during automated operations. The PCAP is on the access door of an LSM.

**PTP** See pass-thru port.

## R

**rewind.** To move tape from the take-up hub to the supply hub. (IBM)

**robot** (An electromechanical device that moves cartridges among the cartridge access ports, the storage cells, and the drives.

## S

**station** In the host software component version of the Nearline software, the connection between the client operating system and the LMU.

**storage cells** A location where data cartridges are kept in the library.

## T

**T9940** A cartridge drive that reads/writes to tapes; the housing for the tape contains a single reel.

**tape.** See magnetic tape.

**tape drive.** A device for moving magnetic tape and controlling its movement. (T)

**theta** The lateral motion of the arm assembly of a library robot about the center column as viewed from the top of the arm, where clockwise motion is considered positive.

**transport** An electromechanical device that threads tape from a cartridge, moves the tape across a read/write head, and writes data onto or reads data from the tape.

## V

**VOLSER** See volume serial number.

**VOLSER label** An external label attached to the spine of a cartridge. The label contains the volume serial number and can be read by people and the camera.

**volume** A data carrier that is mounted or dismounted as a unit. (*See* cartridge).

**volume serial number (VOLSER)** A number in a volume label assigned when a volume is prepared for use in a system. (IBM)

## W

**write-enabled** (A setting on cartridge tapes that allows data to be written on the tape.

**write operation.** An output operation that sends a processed record to an output device or output file. (IBM)

**write protection.** Restriction of writing into a data set, file or storage area of a user or program not authorized to do so. (IBM)

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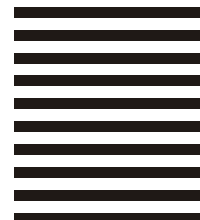
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